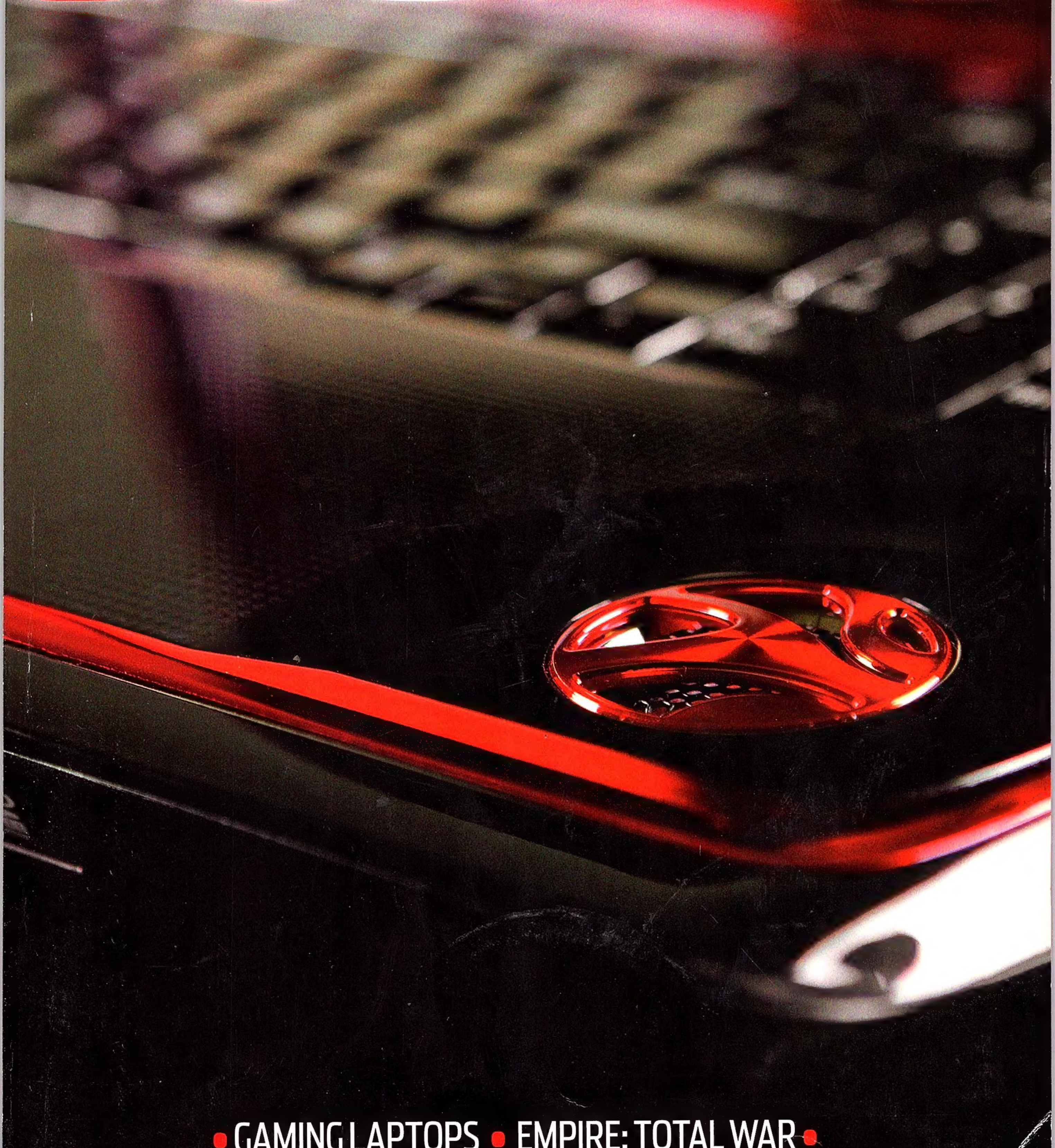
MAXIMUM POWER COMPUTING

atomic



• GAMING LAPTOPS • EMPIRE: TOTAL WAR •
• ARTIFICIAL INTELLIGENCE • PC CASE WINDOW • AMD PHENOM II •

Signature

SERIES

TECHNOLOGY REVOLUTION

THE ANTEC SIGNATURE 850W & 650W REDEFINES POWER SUPPLIES

- **First DC to DC converter**
  Extra stability through regulation
- **Advanced cable management**
  Allows for flexibility and customisation
- **80 Plus® Bronze Certificate**
  Up to 87% energy effeciency
- **Ultra silent**
  Less than 19dB under load
- **Two double layer PCB**
  Increases Current output and provides better cooling
- **Digital PWM Fan**
  Improved low speed control
- **Japanese capacitors**
- **Universal input and active PFC**
- **Independent 5V, 12V and 3.3V feedback and control**
- **5 year warranty**

NVIDIA SLI™ READY

RoHS

80 PLUS BRONZE

NSW

ARC Computers
(02) 9748 8322
www.arc.com.au

Techbuy
(02) 9648 1818
techbuy.com.au

QLD

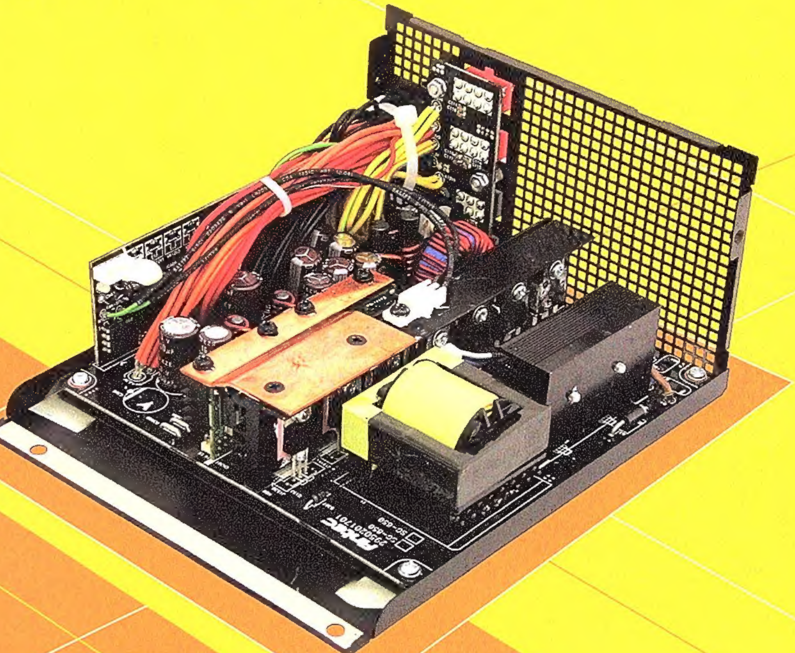
Computer Alliance
(07) 3420 3200
computeralliance.com.au

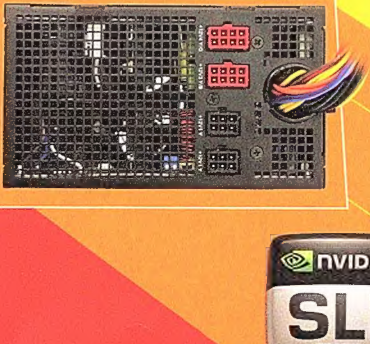
Umart Online
(07) 3369 3928
umart.com.au

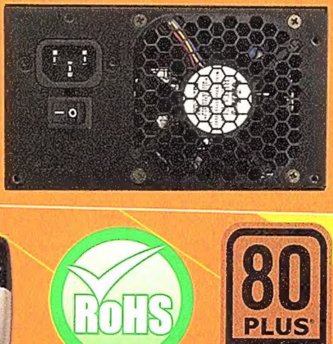
VIC

Centre Com.
-
centrecom.com.au

Computers & Parts Land
03 9548 7088
cpl.net.au







Antec®
Believe it.

EVERY SIGNATURE POWER SUPPLY IS INDIVIDUALLY TESTED AND CERTIFIED BY A QUALIFIED ANTEC ENGINEER.

5 YEAR Warranty

ALTECH COMPUTERS
WWW.ALTECH.COM.AU

SA
Allneeds Computers
(08) 8211 8661
allneeds.com.au

Getright Computers
(08) 8231 0622
getright.com.au

WA
Netplus Micro
(08) 92427288
netplus.com.au

Austin Computers
(08) 9201 2788
austin.com.au

TAS
Principal Computers
(03) 6234 5677
tasmanianpc.com.au

Taspro Computers
(03) 6424 1911
taspro.com.au

EMPIRE
TOTAL WAR™

DOMINATE THE 18TH CENTURY
ON LAND AND SEA

Actual in-game screenshots

There can be only one master of the 18th Century world. Through political manoeuvring and military might, on land and sea, you must crush those who dare stand in your way. Out of the smoke of battlefields, out of the flames of naval bombardments, a new empire will be born...

M Moderate battle violence

www.totalwar.com

• SPECIAL FORCES EDITION •

AVAILABLE FOR A LIMITED TIME

Pre Order now at JB HI-FI and receive the exclusive USS Constitution in-game unit*

The legendary heavy frigate of the United States Navy, used to great effect in capturing enemy ships and running down fleeing opponents. Fast and heavily-armed, the pinnacle of 18th Century US Navy power.

*While stocks last.

© SEGA. The Creative Assembly, Total War, Empire: Total War and the Total War logo are trademarks or registered trademarks of the Creative Assembly Limited. SEGA and the SEGA logo are registered trade marks or trade marks of SEGA corporation. Windows, the Windows Vista Start button and Xbox 360 are trademarks of the Microsoft group of companies, and 'Games for Windows' and the Windows Vista Start button logo are used under license from Microsoft. All rights reserved.

www.sega-australia.com

Games for Windows

EDHEAD

AMD forever

One of the things that – I think, at least – sets Atomic apart from other technology magazines is that we are not afraid to take sides. Call it our 'gonzo'-like willingness to get in there with the rest of the fanbois and mix it up, call it our rabid refusal to believe that raw performance is everything. But the fact is that we are no different from you – we like tech.

When Atomic first started AMD was the king of the enthusiast hill. Its chips overclocked beautifully, even when AMD never intended that to be the case, and it's a real possibility that without the rise of that company, Atomic itself might never have come to be. Years later, we still have a very soft spot for the 'other' chip maker. In various meetings with AMD staff, especially recent ones chatting about the new Phenom II, we've been unabashed in our hopes that AMD can regain its status as the enthusiast's choice.

Unfortunately, that's not the case.

There's a lot to like about the Black Edition of highest specced Phenom II. It overclocks wonderfully, and extreme 'clockers will really dig the fact that it seems to be without a cold bug. I was chatting to Atomic's ex tech writer, Josh Collins, recently and he was practically giggling with glee at the thought of taking a new Phenom sub-zero (and I really must catch up with him and find out how the session went). But sub-zero is not exactly a 24/7 option; the chip gets close to 4GHz under air, which is certainly impressive, but you can get just about the same performance from an Intel chip.

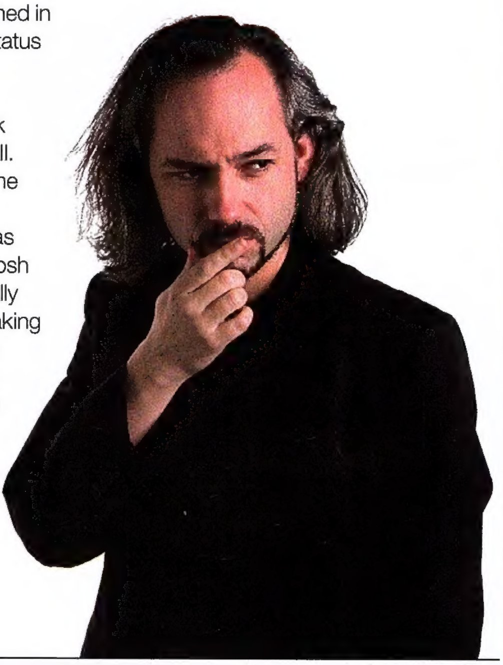
And for less.

You can read more about the Phenom II in our full review on page 34.

It's a reminder that it's important – for any enthusiast – not to let your own fannish tendencies rule your thinking. There are things we like and dislike at Atomic, but we're also not blind to the reality of raw performance and hip-pocket price. We all want to see AMD do well – it would be good for everyone in the market segment for competition to be as healthy as possible. Thanks to ATI's excellent cards AMD's got the edge in the GPU market, but, sadly, the same cannot yet be said of the CPU segment.

But we can dream.

David Hollingworth
dhollingworth@atomicmpc.com.au



atomicCREW

haymarket

editorial
editorial@atomicmpc.com.au
editor david hollingworth
technical writer justin robinson

design
art director david west
product photography jason busch
creative director sam grimmer

contributors
dan rutter, ashton mills, chris taylor, zara baxter, ron prouse, james matson, jake carrol, seamus byrne

production
production manager jamie ferguson
production co-ordinator ewa grygier
printed by webstar

distributed by
network distribution company
(02) 9282 8777
gordon & gotch new zealand
(09) 625 3005

advertising + marketing
t+61 2 8399 3611 f+61 2 8399 3622
group advertising manager joanne nichols
jnichols@haymarketmedia.com.au

haymarket media
t+61 2 8399 3611 f+61 2 8399 3622
52 victoria street, mcmahons point
nsw 2060

managing director jeremy vaughan
publisher jon westnedge
commercial director darren mcnally

Atomic: *Maximum Power Computing* is published monthly by Haymarket Media. Company registered in Australia (ABN 61 083 063 914). This publication may not be reproduced or transmitted in any form in whole or in part without the written permission of the publisher.

Liability: While every care has been taken in the preparation of this magazine, the publisher cannot be held responsible for the accuracy of the information herein, or any consequence arising from it. Please note that all review judgements have been made in the context of equipment available to *Atomic* at time of review.
Editorial and product submission: *Atomic* welcomes all information on new and upgraded products and services for possible editorial coverage. However, we respectfully point out that the magazine is not obliged to either review or return unsolicited products. The Editor welcomes ideas for articles, preferably sent in outline form, with details of the author's background and a few samples of previously published work.
We cannot accept responsibility for unsolicited copy and stress that it may take some time for a reply relating to these submissions to be sent out.

Member of Australian Business & Specialist Publishers Association

97
ISSUE

LOGIN 8

X-Ray 14
File Compression – how and why.

I/O 18
Our monthly helpdesk.

Rise of the Machines 22
Artificial Intelligence examined.

HARDWARE 37

CPUs
AMD's Phenom II 940 Black 34

MOTHERBOARDs
DFI Lanparty 790FX 35

XFX GeForce 9300 36

GRAPHICS CARDs
Gigabyte 4870 1GB 38

Leadtek 9800GT 40

Leadtek 9800GTX+ 41

MSI 9600GT Diamond 42

RAM kits
Crucial Ballistix 1333MHz 43

Patriot triple channel kit 43

COOLING
Xigmatek HDT-SD964 44

ASUS Axe Square 44

MAXIMUM POWER COMPUTING
atomic
Issue 97 • February 2009
$8.95 • Proudly Australian
www.atomicmpc.com.au

GAMING ON THE MOVE!
DREAM MACHINE
WHICH $5,000 NOTEBOOK BEAST CAN REPLACE YOUR DESKTOP PC?

CASE MODDING
Our easy guide to installing a mirrored PC case window

ARTIFICIAL INTELLIGENCE
The Atomic guide to thinking machines. Has the future arrived?

AMD STRIKES BACK!
But can it keep Intel honest?

atomic EXCLUSIVE EMPIRE OFFER
UNLOCK THE USS CONSTITUTION!

EMPIRE: TOTAL WAR
We take a long hard look at what might be the best game of the series

PLUS: NEW CASES FROM THERMALTAKE, LANCOOL & COOLERMASTER! • MIRROR'S EDGE RUNS US RAGGED! • THE COOLEST RAM KIT WE'VE EVER SEEN... AND MUCH MORE!

WIN A CUSTOM CASE! pg96

February

PC CASEs
Thermaltake Spedo 45
Thermaltake Xpressar 46
Lancool Metal Boned 48
Coolermaster Sniper 49
HEAD2HEAD 50
Gaming Laptops

KITLOG 62
The very best enthusiast gear.

TUTORIALS 69

ZFS File Server build, pt2 70
All about setting up Open Solaris to build the ultimate in File Servers.

Fitting a Case Window 74
It's an old classic, but Ron Prouse gives it some new polish.

Atomic.edu 78
Everything you ever wanted to know about universities in NSW.

Geec Chic 81
Zara Baxter talks online comics.

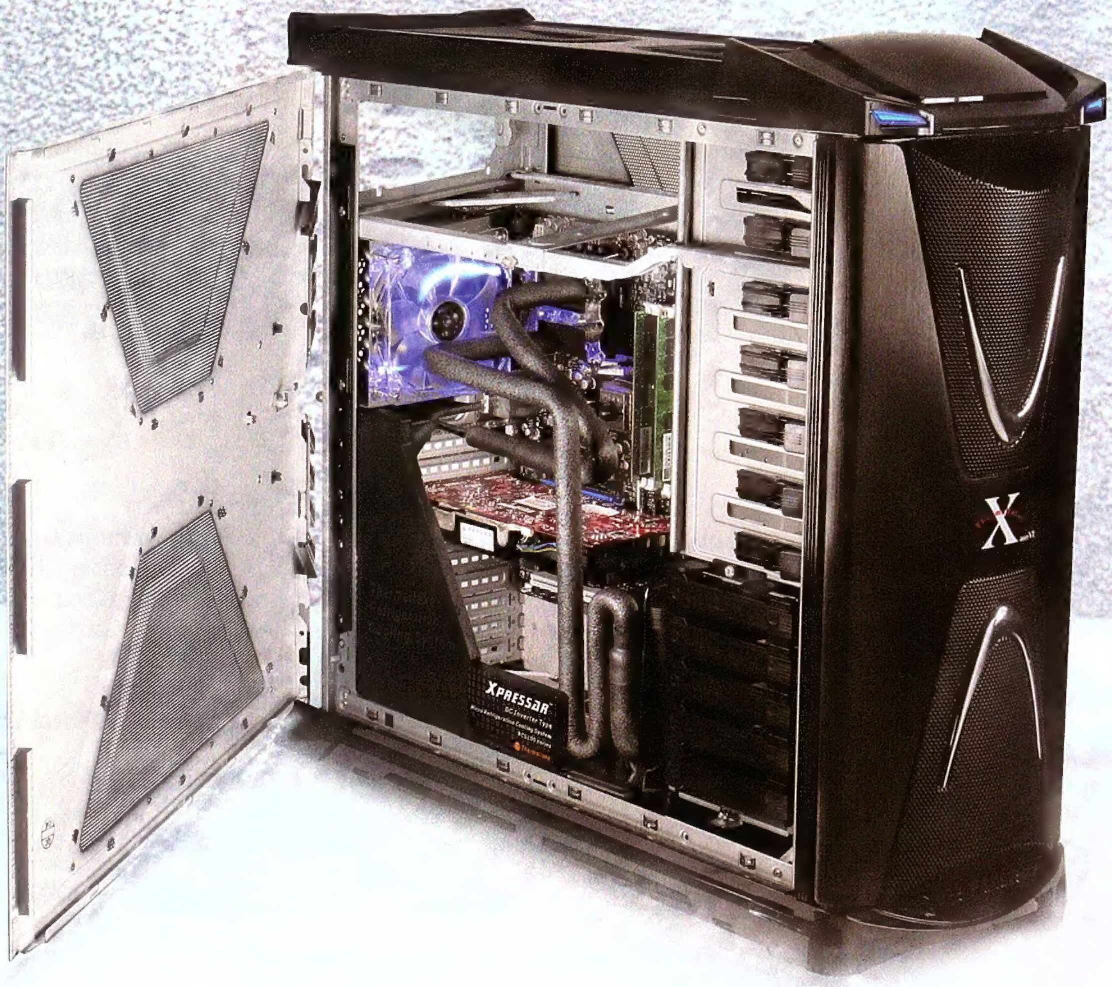
GAMEPLAY 83

Engine Room 84
Diplomatic Immunity
Seamus Byrne goes on the road with Australia's best gamers at the World Cyber Games.

Preview: Empire: Total War 88
GTA IV PC edition 92
Tomb Raider: Underworld 94
Mirror's Edge 95

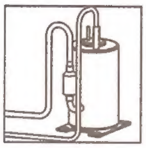
FROST YOUR WORLD

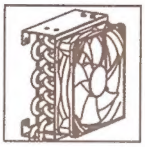
World's First DC Inverter Type
Micro Refrigeration Cooling System

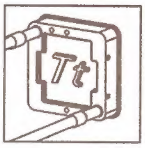


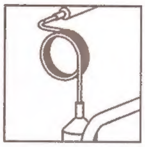
XPRESSAR™ RCS100 series

- Utilizes micro compressor and refrigerant within your PC to cool your CPU, maximizing overclocking potential and peformance.
- 20°C cooler than liquid cooling System
- Equipped with intelligent IC controller to prevent condensation
- Thermal resistance can be <0.02 °C/W under 100% loading.
- High performance micro compressor uses standard 12V power
- Small, low noise, high performance technology.


Compressor


Condenser


Expension Valve


Evaporator

Thermaltake
COOLall YOUR LIFE

www.thermaltake.com.au

WA
Austin Computers
www.austin.com.au
08 9201 2788
PLE Computers
www.ple.com.au
08 9309 4771
Softline
www.softline.com.au
08 9361 4788

SA
All Needs Computers
www.allneeds.com.au
08 8211 8661
D'Ambra Computers
www.dambracomputers.com.au
08 8252 6223
Leader Computers
www.leadersystems.com.au
08 8112 6000

NSW
IJK
www.ijk.com.au
02 9745 0877
J&W Computers
www.jw.com.au
02 9726 2818
Mwave
www.mwave.com.au

QLD
GameDude
www.gamedude.com.au
07 3387 1500
PC Superstore
www.pcsuperstore.com.au
07 3299 3399
Umart Online
www.umart.com.au
07 3369 3928

VIC
Centre Com
www.centrecom.com.au
Computer & Parts Land
www.cpl.net.au
03 8542 8688
Scorpion Technology
www.scorptec.com.au
1300 726 770

TA
Principal Computers
www.tasmanianpc.com.au
03 6235 5010

Eco-Friendly

The year of the Solid State Drive

Wave goodbye to platters and hello to solid win.

If you're like us and get your presents from Geek Santa (bringer of hard drives, case fans and video cards) as opposed to ordinary Santa (bringer of socks, jocks and those crazy wooden puzzles) then while you might have been out of luck last year, 2009 could see an SSD (Solid State Drive) in your stocking, with big players ramping up sizes, speeds and product ranges in an attempt to push the SSD market further into the mainstream.

While pricing is still a sore point the tech specs are getting juicy, with Samsung announcing 256GB drives with a read speed of 220MB/s and a write speed of 200MB/s. Mitron – another drive manufacturer – is looking to top even those speeds, with an SLC based SSD drive that'll do 260MB/s read and 240MB/s write without breaking a sweat. And that's okay, because with numbers like that, we're doing all the sweating.

Hot.

Massively open-source

Myst Online: Uru Live goes freeware!

If there are any companies who've released – by their standards – unsuccessful MMORPGs, and ditched the player base and folded the servers, take note. Cyan Worlds, Inc., the makers of the Myst series, has announced it'll be making its unsuccessful MMORPG Myst Online: Uru Live into an open source title. Everything is going to be exposed like a stripper at midnight, with all the tools, client and server software source code being released for the masses while Cyan Worlds will continue to host the data on their own servers. This is what should happen when big MMO games don't make enough money for continuation, but still represent a product of value to many gamers. Give it to them open source with open arms, maybe chuck some in-game advertising in to keep the game funnelling revenue to the parent company, and all of a sudden the world of gaming is a better, nicer, more MMORPG-populated world to live in.

SHORT CIRCUITS

What the Office of Film and Literature Classification taketh away, they occasionally – so very occasionally – giveth back. With disgruntled Australian gamers becoming used to the sight of game after game being 'Refused Classification' in Australia (which equates to a fat insta-ban) it was quite the turn of events to see F.E.A.R 2 banned, then un-banned by the classification board. The review board has decided that the horror FPS (which admittedly does feature some absolutely tile-staining blood and guts spills) isn't as full of ultra violence as previously thought. So they've reversed the banning, giving Aussies a clear path to the spooky and spectacular FPS madness that is F.E.A.R. Are they evolving? Dare we start to believe?

China; is there nothing this economic superpower can't rip off and turn into a cash cow like complete professionals? Apparently not. The communist nation – inexorably tied to the world of MMORPGS thanks to its prolific gold farming industry – has finally taken the cake and released a World of Warcraft themed restaurant. From the 'Dark Portal' front door to the walls adorned with WoW themed paintings and the TVs playing WoW footage for guests, there's something so cool and yet so twisted about the whole Azeroth eatery concept. But if there's a chance we'll get to roast Murlocs, we're in.

Burning down the house

Sony wants you to believe Home is where your heart should be. **James Matson** disagrees.

For the most part, Sony is frighteningly adept at developing and releasing immensely popular console technology. A towering empire was built with the PS1 and PS2 that has been extended (though not as impressively) with the Playstation 3. It's for this reason that when Sony geared up to unleash it's new virtual social networking environment on the PS3 dubbed 'Home', the Playstation community was champing at the bit to get their controller shaped hands on it. With the new look Xbox 'Live' service proving that a clever, intuitive social networking and game matching service can be crafted and delivered in style, most of us were expecting 'Home' – which has been in development for three years now – to be a killer piece of software kit.

But when the open Beta was released to all Playstation users this month, praise was not heaped, adoration not felt.

In fact, from many sources online and off, the reception could be described as just a bee's wang warmer than covering yourself in ice-cream and slurpee slush and sticking your head in a freezer for a few hours. In Antarctica.

And haven't we all done that at one stage or another?

For Australian users at least, initial attempts to connect to Home were laden with network problems and connectivity issues, and once actually inside the environment a singular thought seemed to occur: What's the point of all this? What are we doing here? Why did Sony do this after we all saw Second Life (an environment 'Home' seems to be modelled on) lose players in the thousands because it dawned on folk that the whole gig was just a pointless and inferior replacement for real social interaction?

What Sony has done, in effect, is offer a game matching and content viewing system that just happens to be held together by a virtual hangout, with virtual versions of real-life games like Pool to play, a virtual apartment to fill with virtual furniture from virtual shops and, well you get the idea.

The above is the unique part of Sony's offering in comparison to Microsoft's 'LIVE', and according to many, its greatest weakness. **Eurogamer.net** commented that Playstation 'Home' appeared to be "an unruly melee of greasy flirting, spammed greetings and aimless A/S/L enquiries. Female avatars get attention everywhere in Home; they're absolutely mobbed, relentlessly shadowed, danced at and messaged." **IGN.com** had similarly disparaging remarks, "this is a waste of everyone's time. Whether it was watching a pixelated Twilight trailer in the theatre while some kid said 'Emo sucks' over and over or whether it was watching a dozen or so people just stand around the Far Cry 2 room without saying a word, Home has not made me feel like this was something the PlayStation audience needed."

The Microsoft approach gave people what they need in an online console – quick, seamless connectivity to games, easy and varied ways to contact and privately talk to fellow gamer's online and simple GUI access to Xbox content like movies or demos.

Sony appears to have lumped players with a whole bunch of bling they don't need (and many don't want) in order to access the stuff that really matters.

Home is still Beta, and there are interesting additions in the pipeline like funky games to play within the environment and more diverse online stores, but the general consensus at the moment, the underlying hum, is that after three years of development Sony has given us all a virtual world that's in desperate need of heavy renovation, the kind that only a blow torch and wrecking ball could potentially achieve. Did these guys really make EverQuest?

Female avatars get attention everywhere in Home; they're absolutely mobbed, relentlessly shadowed, danced at and messaged.

FROM ATOMIC ONLINE

Here's just a taste of the stories we've posted up on the Atomic website this last month:

Depression, PCs and Dollars
A handy guide to keeping your tech habit going during 'these unstable financial times', from Vita Cassissi.
www.atomicmpc.com.au/Feature/129438,depression-pcs-and-dollars.aspx

A Tale of Two Gamers
Two big nerds. A whole year of big MMO releases. Find out the state of the MMO nation in this point/counterpoint style chat between David Hollingworth and James Matson.
www.atomicmpc.com.au/Feature/131085,a-tale-of-two-gamers.aspx

Thermalright Ultra 120 Extreme 1366
Our first look at the new Nehalem-ready version of one of our favourite heat sinks, the TRUE 120. Features a mess of pictures!
www.atomicmpc.com.au/Review/130468,thermalright-ultra-120-extreme-1366.aspx

ASUS Widescreen LCD monitors

SEE MORE · HEAR MORE

WITH FULL HD EXPERIENCE

26" / 24" wide screen with Full HD 1080P high resolution and 170 degree wide viewing angle.Experience prestine Full HD 1080P vision and stunning clarity of HD DVD and Blue-ray Discs together with HDMI input. Embedded HDMI interface simplifies cabling and provides the highest-quality multimedia audio and video experience. Built-in 2.0 M (rotatable) / 1.3 M pixel webcam brings vivid image transmission during video communication. ASUS Smart Contrast Ratio (ASCR) 20000 : 1 resulting in more realistic depictions of night scenes during games or movies. Trace Free Technology provides 2ms (GTG) quick response time to enable smooth video playback. Various video inputs link all gears into one monitor, including HDMI, DVI, D-Sub and Component (YPbPr) inputs. (VK266H)

www.asus.com.au Available from all major resellers

DCDi by FAROUDJA

Splendid Video Intelligence Technology

3 Years Warranty

GEARBOX

All the best and coolest gadgets and gear.

1.

2.

4.

3.

5.

1. Throttle eSATA drive

Price TBC **Website** www.ocztechnology.com

Small and fast, baby, yeah, that's where it's at! And there's nought smaller or faster than the Throttle eSATA drive from OCZ Technology.

The Throttle comes 8, 18 and 32GB flavours, and they're blindingly fast. Why? Well, look at the name, you fool! This is no mere USB stick – pah, that's so last year. No, this little devices uses eSATA to deliver 90MB/second read speeds and 30MB/sec write speeds, almost literally pushing more data than you'll know what to do with. It's perfect for high-res photography, large HD video files or stupid amounts of screenshots of your best moments in Tetris. And if an eSATA port is hard to come by, you can also take advantage of an auxiliary mini-USB port in case of data transferral emergencies.

2. Kingston 64GB DataTraveler

Price $299 **Website** www.kingston.com/anz

Small and fast, bab... oh, right. We did that. Um. Yeah.

So, uh, look, here's a USB stick... um, wow, we really put these in the wrong order, didn't we? Wow, how embarrassing. But, uh, look, do me a favour and just pretend that the just being faster isn't everything. You know, sometimes size matters, right.

Right?

So, that being the case (and it is, isn't it?), this new 64GB thumb drive from Kingston is hella impressive! Hoo-boy! 64GB, gee you could fit a lot of stuff on that. Might take years to get it off compared to, um, some products, but speed's not everything. Is it? I...

I got nothin'.

(But come on, 64GB of stuff on something you can carry on a keyring is damn cool. There, I said it – *ed*)

3. Memorex SingStand

Price $199 **Website** www.memorex.com.au

Okay, let's be honest a moment. We all have those guilty pleasure songs that you absolutely have to sing along to, right? You know, no one's home, you put on Gold by Spandau Ballet and then you just let it all hang out. Everyone does it.

But what if you could do it and sound really good, and even knock out the original vocal so you're the real star – without a karaoke machine or a copy of SingStar? It would rock. And that's what the SingStand can do for you. You just plug your iPod or other MP3 player into it, and it does the rest – for any track in your collection. It boosts your voice, provides an echo for 80s classics, and you can even plug other instruments into it.

About the only thing it doesn't come with is dignity. But who cares about that, right?

4. Samsung HT-BD2ET

Price $1,099 **Website** www.samsung.com.au

We can't all afford 9-billion dollar speaker setups, sadly. Would that we could, so we could then just buy this $1,099 integrated bookshelf Home Theatre system in a Box (or HTiB, as the marketing droids put it). Safe in the knowledge that we were getting a great picture, sound good enough for any normal human (as opposed to an audiophile – clearly a whole separate species), DVD upscaling, full 24fps playback and more, we could spend the other $8,999,998,901 on more important stuff.

Like a 4870X2 CrossFire rig.

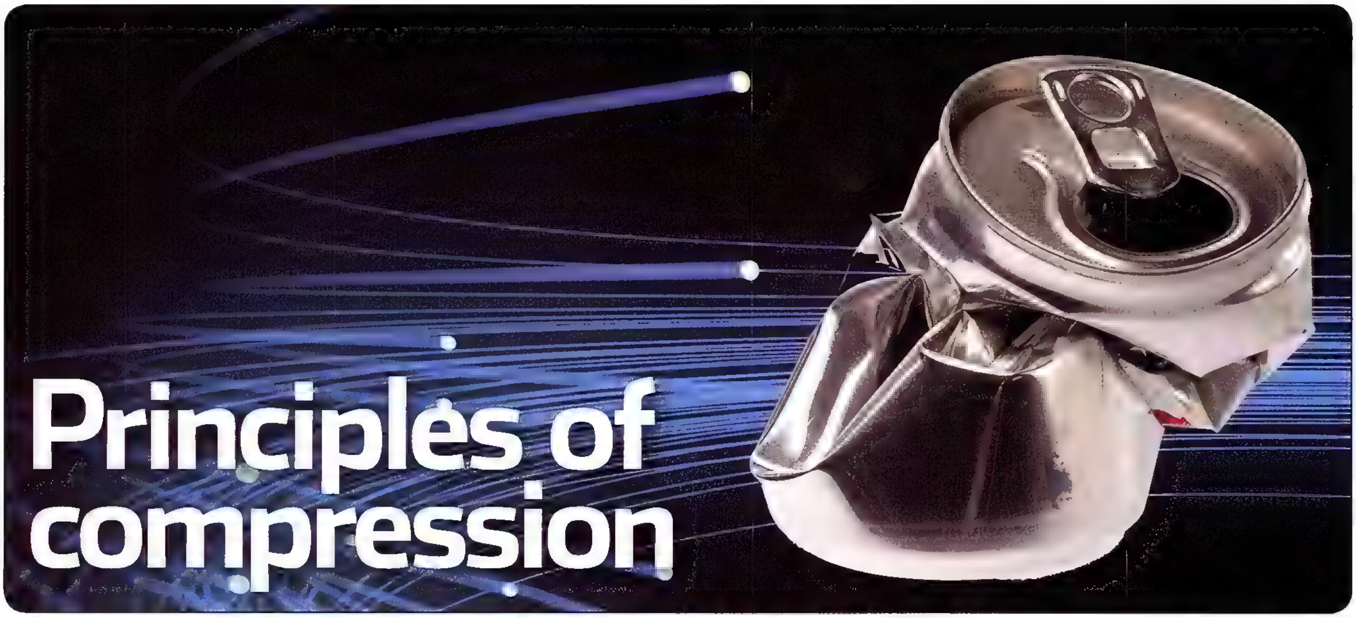
You just gotta have your priorities straight.

5. Undead Rogue action figure

Price $US12.99 **Website** www.thinkgeek.com

Here's the main reason we think this World of Warcraft action figure is the bee's knees. Sure, it's super detailed and cool, but we've been ganked by so damn many Undead Rogues on the outskirts of Lakeshire that we just cannot wait to get one of these, rip it out of its packaging, and take to it with a ball-peen hammer.

But we're not bitter.



Principles of compression

We take it for granted, this everyday innovation. Yet it's one of the building blocks of most everything we do with technology. **Ashton Mills** unravels the bits.

Compression is a fascinating subject because it appears, at the surface, to create something from nothing and nothing from something. And it's been a part of computing since, well, before computers. Morse Code, in use since 1838, used shorter codeword substitution for certain letters, a function which is the very basis of compression.

It wasn't until 1951 however that the science started in earnest with then PhD student David Huffman, building on the earlier work of luminaries Claude Shannon and Robert Fano, devising Huffman encoding – a technique still used today.

By the 60s new methods were emerging that improved on Huffman, and by the 70s compression utilities were commonplace on Unix systems. Much better algorithms were also being developed, including the famous (for compression geeks at least) LZ77 and LZ78 by Lempel and Ziv, which led in the 80s to LZW – one of the most ubiquitous techniques used today in everything from GIF and TIFF images through to modems, file systems, and as a basis of other compressors. Indeed, LZW gave rise to PKZIP in 1989, and if you don't know what zip is you probably shouldn't be reading this mag.

By the late 80s it was becoming apparent that, even advanced as they were, new methods were needed for the deluge of formats for images, audio, and video. This spurred the introduction of JPG in 1992 and MP3 in 1996, and the rest as they say is history. Literally, compression has changed our world.

The importance of compression

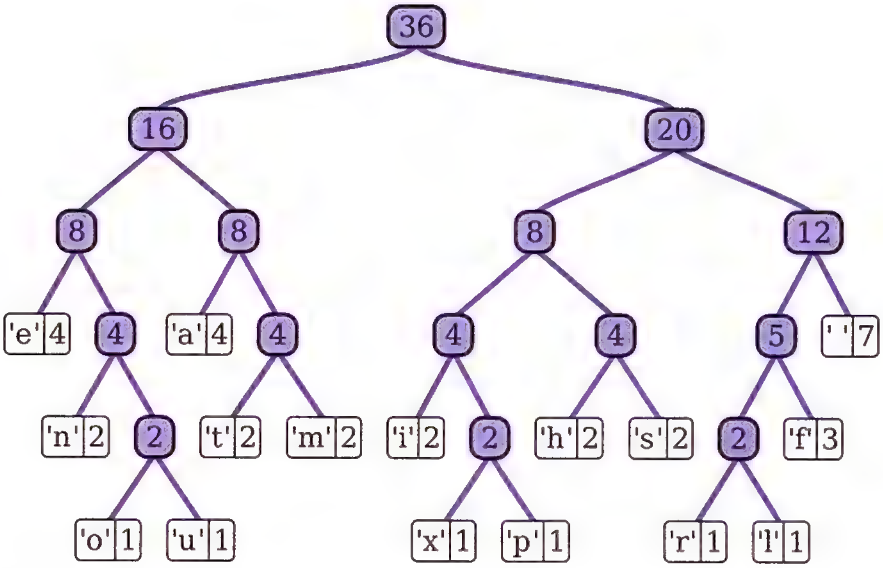
While once the development of compression was partly driven by limited diskspace, memory, and bandwidth (hands up who used V.42bis on their US Robotics 56k modems?), it certainly hasn't gone out of fashion as technology has leapfrogged. Today it plays a role in both hardware and software from the tiniest of embedded devices to behemoth supercomputers.

And even though we have more memory, storage, and bandwidth than ever before, the volume of data we play with has also increased and so compression continues to play an important role.

It's used to maximise memory and storage in your phone, and in transmitting and receiving the calls you make. It's used in your wireless router on its compressed file system and in wireless networking, on your camera as it saves images, in your portable media player with music and its onboard OS, it's even used in your car (well, if it's kinda modern). It's used in the games you play to maximise system resources through compressed audio and texture formats. And it's ubiquitous all over embedded industrial and military applications.

Even the pages of this magazine are sent digitally to the printers in a compressed format.

And it hasn't just helped advance technology; it's created entire new industries – such as the



Huffman symbol substitution, illustrated as a binary tree, of the sentence "this is an example of a huffman tree". Source: Wikipedia.

iPod, and the transition from VHS to DVD. From communicating to satellites on the other side of our solar system, to the humble interweb back down here on Earth, compression is everywhere.

Now that we've covered the what and the why, let's look at the how.

Thanks to compression, Apple gets to sell you an iPod.

Substitution

To be sure, compression is a hefty science; most people learn about it through expensive tomes of hallowed knowledge. Nevertheless, I'll endeavour to cover the basics here, because that's part of the beauty of compression – even though today's complex algorithms could do your head in, they nonetheless work off the same principles I'll cover, because at the end of the day they're all trying to do the same thing.

The first of these is substitution. As mentioned earlier, Morse Code used some substitution and so did Huffman. In its simplest form, we can demonstrate a form of substitution known as RLE, or Run-Length Encoding. RLE simply substitutes the repetition of a character with a value for that many characters repeated, such that a string 'aaaaabbbbbcccc' would become 'a5b5c4'. Saving or sending the RLE version would take less time, yet the original data is there if you know how to decode (and you do).

But let's take it a step further. When you save a text document the letters in the words are saved as their 8-bit binary ASCII representations. For example, the letter 'e' is '01100101'. If we wanted to create a compressed version, we don't have to stick with 8-bit values for the whole alphabet, and instead might choose to allocate less bits for some letters. For example:

a - 00
b - 01
c - 100
d - 101
e - 110

And so on. Note in *practice* there's a bit more to it, as you'd need to determine when an '01' belongs to a 'b' and not a segment for 'd' when decoding, but the theory is what's important for the moment. You can encode around half the alphabet with 4-bits (up to 16 possible values), so if you were to run a document through this compressor you could (theoretically) shave around 25 per cent off (half the alphabet, half the number of bits) the file size.

But that depends on the letters being used doesn't it? Only half your letters can be represented by 4-bits, and if those letters aren't used, then there's no saving.

So let's improve it. It's accepted that in the English language letters such as 'e', 'o', 't', 'i', and 'n' are much more common than the rest of the alphabet. Even sticking with our current encoding method, we could improve the performance of the technique by assigning these most common letters to the shorter bit substitutions:

e - 00
o - 01
t - 100
i - 101
n - 110

While this is a simple example, it reflects the principles of compression and how much of the work goes into finding new ways to encode more data into less bits. Some advances take an already effective method, and add to it, just as LZ77 and LZ78 led to LZW, and LZW led to PKZIP.

Which, in turn, leads us to dictionaries.

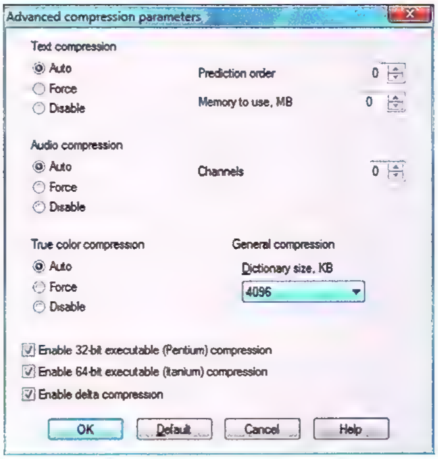
Dictionaries

It's implicit in our above example that we've already got a table in mind that maps letters to numbers. This is known as a dictionary, as it's a reference for the algorithm to look up the values for each letter. So what if you added whole words to the dictionary, and represented words with codes in the output? Suddenly words like 'the', 'david', 'makeover', and 'atomic' (you just had to... *–ed*) can all be reduced to numbers like 00, 01, 10, 11. The space savings increase. Indeed, entire paragraphs can be represented by a handful of numbers.

So dictionaries are another principle compressors use today, but their implementation is a science within itself.

Our above example is a static dictionary; we know in advance the substitutions we want to make. But static dictionaries have limitations. For one, what if the source file doesn't use many of the words in our dictionary? Feeding French into it, for example, won't yield a good result. Additionally, the decompressor needs to know the dictionary to decode the compressed form, so that needs to be sent (or be already present) with the output data.

An alternative is a semi-adaptive dictionary, one which is created by first scanning the input file and building a dictionary based on this. This would provide greater flexibility and better performance, but it's impractical and slow to scan a file in advance (think about compressing a 1GB file), not to mention uses up more system resources. Also, the dictionary needs to be sent with the output file, and a large dictionary can be counter-productive to the efficiency of the



Text compression
● Auto
○ Force
○ Disable
Prediction order 0
Memory to use, MB 0

Audio compression
● Auto
○ Force
○ Disable
Channels 0

True color compression
● Auto
○ Force
○ Disable

General compression
Dictionary size, KB
4096

☑ Enable 32-bit executable (Pentium) compression
☑ Enable 64-bit executable (Itanium) compression
☑ Enable delta compression

Selecting the dictionary size for RAR.

compression.

Which is why most dictionaries used today are fully-adaptive. This type of dictionary is created on the fly as the file itself is compressed, and it has a number of advantages. For example the first time the compressor comes across the word 'atomic' it stores it as is, and adds it to the dictionary. The next time is sees 'atomic', it simply adds an index reference to the dictionary. This method doesn't use many resources, is fast because it's not scanning in advance, and best of all you don't need to send the dictionary with the file – instead the decompressor simply performs the process in reverse: it'll see the word 'atomic', add it to its dictionary and assign an index, and thereafter expand all references of the index to 'atomic' as it writes the output file.

Lean, mean, and nifty cool. Which leads us to *sliding windows*.

Sliding Windows

Another principle that's used often comes about as a function of the dictionary. It's all well and good to build a dictionary on the fly, but especially with large files of disparate or binary data, a dictionary is going to have limits. How do you define a word or phrase (like 'lean' and 'mean') to match further in the file? How many bytes do you grab, and how large do you let the dictionary become?

... rather than store the data of the actual waveforms, the differences between the change in a waveform itself can be stored.

Leaving aside a discussion on choosing phrases for a moment (as this is, also, a science within itself), one method of both optimising performance and keeping resource usage under control is to use a sliding input window. Instead of trying to process a file as a whole, and continually add words into the dictionary, only a given 'window' of data is processed at a time, and the dictionary built around it. As data is read, it's added to the start of the window while data at the end is moved out, hence it 'slides'. For example a 64KB window would process 64KB at a time as the input stream moves through it.

A sliding window allows a compressor to adapt to the content of the source, and prevent the dictionary from becoming stale. For example, if a file contained both text and binary data, the dictionary built on the text segment wouldn't help much when the binary data starts feeding in. It's inefficient to keep expanding the dictionary (see above), and the current contents don't help, so you simply let the dictionary continue to develop on the fly as the compressor starts finding phrases in the binary data.

Naturally this means that the bigger a sliding window, and the bigger a dictionary, the better a compressing algorithm can perform. However this also uses more system resources (memory and processing power), and takes longer to run, up to and including a breakeven point where the trade-off isn't worth it. Hence, as you're aware, when you're looking at compressors like Zip, Rar, and 7Zip you'll always find options for speed/space tradeoffs, and some may even let you set a sliding window dictionary size. Methods that squeeze the most data take longer to do.

As before, all forms of compression are about finding ways to reduce a given input stream into a shorter version of the same. However not all methods and algorithms work best for different types of data. Images, audio, and video files aren't quite so amiable to the methods that work well with text for example, because the pattern of data in these files follows different conventions. Which is of course why we have compressors and formats specifically tailored to them.

Image, video, and audio

As mentioned earlier, formats like GIF, JPG, TIFF and many others, not to mention MP3, Ogg, WMV and the rest are all borne from compressors optimised for these target sources. These are also, of themselves, a science. For example unlike text and binary, which have their own patterns, the data in images can often consist of lots of data that, while not always changing from one sequence to the next, can consist of variance of data – such as a color gradient. Rather than repeatedly store the actual data for every pixel, for example, a compressed image format might store simply the variance between one pixel and the next. Then, if you lax the threshold of what constitutes a variance, you can suddenly save a lot of data, though of course with a trade-off, which we'll get onto in a moment.

Video, too, has its own specific traits. Some video compressors treat each frame as an image, and compress the images individually, but just as the data within an image can be repetitive (or closely related), the same is true of video as well. When an actor is talking on screen, their mouth might move but the background is static, and the data between all those repeated frames can be substituted, and thus compressed, to save space. These two methods are known as intraframe and interframe compression respectively.

And audio, of course, is another beast. Using music as an example, rather than store the data of the actual waveforms, the differences between the change in a waveform itself can be stored. Some techniques work by modelling what is expected next in a waveform, and storing the variance of the actual waveform to the predicted model.

Of course all of these methods also share something in common (with the exception of some formats) – they are a lossy approach to compression. While we generally notice if words go missing in a text document, and binaries don't take kindly to bits disappearing, lossless compression isn't necessarily required for images, video, and audio. As humans we have limits to our perception, and tend not to mind or notice degradation of quality up to a certain point. Said another way, there's sometimes a lot of data a compressor can simply throw away entirely with these formats because its loss is imperceptible, or acceptable, to us. And this, of course, can save a lot more space. The art of good lossy techniques lies in determining what can be dropped and what can be compressed to approximate equivalents, and still provide an almost indistinguishable result from the original. Or, of course, electing to save even more space and be more generous with approximations until we do notice the difference, but it's a choice we make for the quality/space tradeoff – such as low or high bit-rate audio and video formats.

Compressed textures allow you to see this without needing a 4GB VRAM card!

History Repeats Itself with ATCS 840

Two x 230mm top fans for quiet yet powerful outward airflow.

Slide-out motherboard tray for convenient component upgrade.

Dedicated graphic card air duct.

Option for dual PSU configuration.

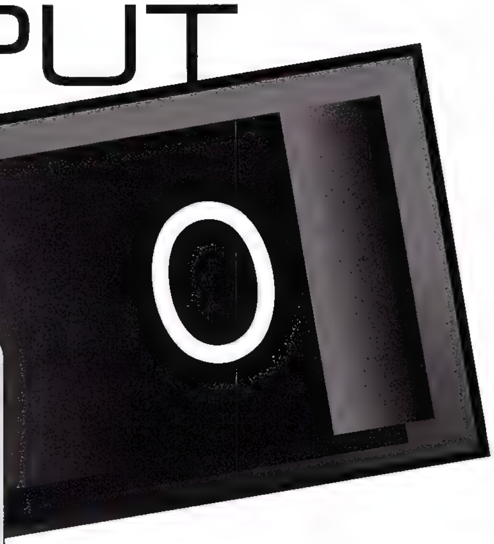
www.coolermaster.com

Premium Resellers

VIC	Computers & Parts Land	03 8542 8688	www.cpl.net.au
	Centre Com	1300 007 600	www.centrecom.com.au
	MSY Technology Pty. Ltd.	03 9560 2288	www.msy.com.au
	Scorpion Technology	1300 726 770	www.scorptec.com.au
NSW	ARC Computer	02 9748 8322	www.arc.com.au
	Aus PC Market	02 9646 8088	www.auspcmarket.com.au
	Capitol Computer	02 9281 8890	www.capitolcomputer.com.au
	IJK International P/L	02 9745 0877	www.ijk.com.u
SA	Adrenalin Computers & Software	08 8410 0777	www.adrenalin.net.au
	DIY I.T. Supply	08 8340 8090	www.diyit.com.au
	MSY Technology	08 8212 1656	www.msy.com.au
QLD	Computer Alliance	07 3421 3200	www.computeralliance.com.au
	Game Dude Computers	07 3387 1500	www.gamedude.com.au
	Dreamworks IT	07 3396 0544	www.dreamworks.com.au
	Umart Online	07 3369 3928	www.umart.com.au
WA	Austin Computers	08 9201 2788	www.austin.net.au/index.asp
	Trinix Computers	08 9350 1600	www.trinix.com.au
	YNOT Computer Systems	08 9330 7666	www.ycs.net.au
	Netplus Micro Computers	08 9242 7288	www.netplus.com.au

INPUTOUTPUT

Dan Rutter brings the answers to your questions like no-one else can.



I/O OF THE MONTH

Each thumb drive comes with free Harbour Bridge!

I I just got suckered.

I bought a '16GB' USB drive on eBay super-cheap, and it's a fake. I suppose the scammer's plan is that by the time someone uses more than the 512MB or whatever the thumb-drive actually has, and discovers that now files go in, but they don't come out, it'll be too late to file a complaint. I actually tried filling it up as soon as I got it, though, and it wasn't pretty.

I doubt I'm going to get a lot of satisfaction from the scammer, but I'd like to repartition the drive to 512Mb or whatever so I can at least actually use it. When I go to Disk Management in Windows and try to select 'Delete Partition', though, it's greyed out.

Am I going to have to buy Partition Magic or something to make this piece of crap work?

Edward Krupp

O I wouldn't trust one of the horde of eBay fake-drives with anything if I were you, but yes, you probably can make the thing work, more or less.

As you've discovered, Disk Management won't let you delete partitions on 'removable' devices. There are utilities that're meant to flip a bit in the firmware and turn removable drives into 'fixed' ones, but I wouldn't bet on them doing anything good to a fake-drive.

You don't need to buy anything, though. The usually-suggested solution here is to boot a GParted Linux LiveCD and flail around randomly like dumb Windows users always do until the problem is solved, but the standard 'qtparted' program that comes with Knoppix and various other LiveCDs will work, too.

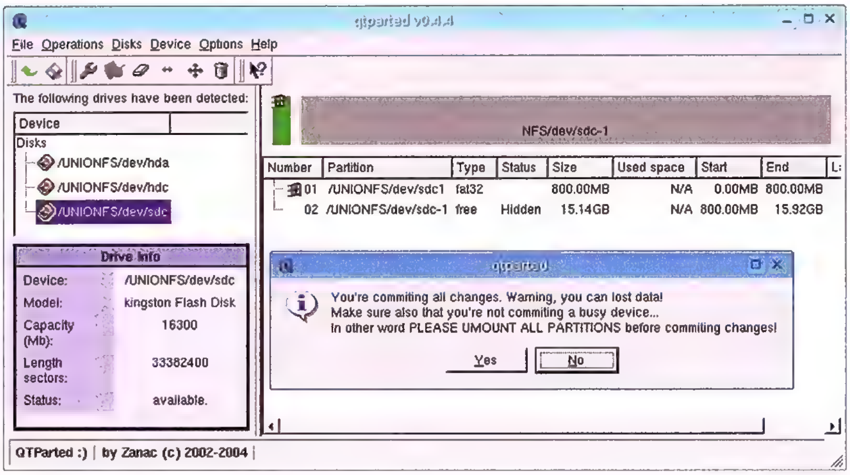
(And yes, fellow dumb Windows user, you can just do the Knoppix equivalent of Start > Run > type 'qtparted', and it'll work!)

Make sure you don't tell Linux to make the new partition use the non-Windows-compatible ext3 filesystem, and also bear in mind that if you try to format the drive back on Windows it'll probably revert to its fake 'official' size. But apart from that, it'll now, to a first approximation, work.

I/O OTM

WINS A LOGITECH G5!

There's a mouse in the house. Okay, it's not in the house, it's in I/O. And it looks damn good.



```
The following drives have been detected:
Device
Disks
  /UNIONFS/dev/hda
  /UNIONFS/dev/hdc
  /UNIONFS/dev/sdc

Drive Info
Device:            /UNIONFS/dev/sdc
Model:             kingston Flash Disk
Capacity (Mb):     16300
Length sectors:    33382400
Status:            available.

NFS/dev/sdc-1

Number Partition            Type   Status  Size      Used space  Start     End       L:
  01   /UNIONFS/dev/sdc1    fat32          800.00MB  N/A         0.00MB    800.00MB
  02   /UNIONFS/dev/sdc-1   free   Hidden  15.14GB   N/A         800.00MB  15.92GB

qtparted
You're commiting all changes. Warning, you can lost data!
Make sure also that you're not commiting a busy device...
In other word PLEASE UMOUNT ALL PARTITIONS before commiting changes!

QTParted :) | by Zanac (c) 2002-2004 |
```

Has a Windows user ever booted a Linux LiveCD because something good has happened?

They should never have invented the directory

I I've got this messy 'temporary' folder full of subfolders and sub-subfolders and so on, and there's some stuff in there that I can't delete.

When I try, Windows gives an error saying "the file name you specified is not valid or too long", which is a pretty neat trick since I didn't specify any 'file name', I just clicked the folder and pressed Delete.

If I drill down into the directory structure I can delete most of the stuff in there, but there are some deeply nested files that just won't go away.

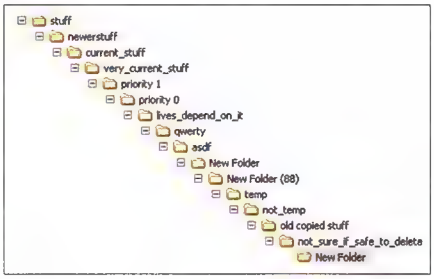
How can I kill them, without formatting the drive?!

M Sullivan

O The 'file name' Windows is complaining about is not just the actual name of the file, but the whole fully-pathed name, including all of the folders.

If a pathed file name exceeds 255 characters, several basic Windows functions will barf. Not just delete – you're likely to have trouble opening the file, too.

It's easy enough to create files with over-long full names, by for instance moving a bunch of nested directories inside some other already-deeply-nested directory, or by copying stuff



```
⊟ stuff
  ⊟ newerstuff
    ⊟ current_stuff
      ⊟ very_current_stuff
        ⊟ priority 1
          ⊟ priority 0
            ⊟ lives_depend_on_it
              ⊟ qwerty
                ⊟ asdf
                  ⊟ New Folder
                    ⊟ New Folder (88)
                      ⊟ temp
                        ⊟ not_temp
                          ⊟ old copied stuff
                            ⊟ not_sure_if_safe_to_delete
                                New Folder
```

I'm sure we've all been here.

from a less restrictive operating system – Mac OS, for instance – to Windows, especially if you copy it into an already-deeply-nested folder.

The quick and dirty solution to this problem is to just reduce the path to the file by hand, by giving shorter names to the subfolders along the way. If you've got many files to deal with that all have different deeply nested paths then this is impractical, but usually you can solve the problem by just renaming half a dozen directories to 'a'.

If you'd like to deal with this problem – and several others – more elegantly, try 'Unlocker':
ccollomb.free.fr/unlocker

Fourth Wire Of Mystery

I recently bought a new motherboard, and the CPU fan connector on it is compatible with these new four-pin PWM (pulse-width modulation) cooling fans.

From what I can gather, they have an extra wire, and use PWM to cut the duty cycle to a certain percentage, in order to slow the fan down when maximum cooling is not required.

I have two questions:

1. Why use PWM at all? What's wrong with the old way of fan throttling (reducing the DC voltage)?
2. Why the fourth wire? It seems like pulsating DC can be delivered with two wires as easily as four.

Chris Wilmes

PWM fans have their own built-in speed-control hardware. The signal on the fourth wire tells the fan how fast to spin, and it takes care of the actual power-pulsing by itself. Perhaps there's some sort of feedback via the speed-pulse data on the standard third wire, but I think that's unlikely to be necessary for PC applications.

I don't think pulse-width-modulating the power going into a normal two- or three-wire fan will work very well. Their brushless motors probably will spin slower if you give them pulsed input, but the result will be unpredictable and probably also inefficient, as the motor tries to spin to full speed each time it gets a pulse. So yes, the motherboard could send PWM power to fans, but it probably wouldn't work too well.

Just reducing the voltage will work with any DC fan. But it requires the motherboard to have some kind of variable-resistor hardware, which costs money. PWM is preferable because it's just switching. Turning stuff on and off over and over very, very fast is easy to do with modern semiconductor technology, but actually reducing DC voltage always requires you to dump excess power to heat. This, essentially, is why switchmode power supplies are so popular today, while old-style heavyweight low-efficiency linear PSUs are dying out.

Ordinary brushed DC motors work just fine from pulsed input, by the way. That's how the speed controllers in model cars and cordless drills work. They usually have a pulse frequency in the audio range, which is why the motors 'sing' noticeably, especially when the throttle's only just open and there's no 'real' motor noise to drown out the voice-coil behaviour of the motor coils seeing the narrowest PWM pulses the controller can deliver. Squeeze the trigger of your cordless drill or the throttle of your R/C car just a little bit, and before the chuck, or the wheels, get enough torque to overcome friction and start turning, you'll hear the motor going "eeeEEEeeeEEeeee...".

You'd think shotguns would be more fun

I took home my boss's computer to repair it. Seemingly easy diagnosis of a bad power supply. We replaced it with one from the shop, a brand new Thermaltake with 50 watts more than he had before. The old supply was clearly bad; before the pilot on the motherboard wouldn't light and now it does. But now the computer (a Gateway. Don't blame me, I didn't buy it...) steadfastly refuses to boot.

I jumped the green wire to ground and the new supply turns on just fine; the drives spin up and the fans come to full tilt, but there is no display or other output; not even keyboard lights or POST beeps.

I checked the switch by jumping the 'turn-on' terminals, and the board will still not power up. Any clue what's gone on here? Thanks for any input!

Sean

This is the sort of problem that can only be solved by shotgun debugging – removing parts and seeing how, or if, the problem changes, then adding the parts back in and/or swapping them out for alternatives until you locate the fault.

UNLESS, that is, the Gateway PSU was non-standard in some way, like Dell PSUs used to be. This is probably not the case, but I'm not certain.

If you asked me to guess what the actual cause of the problem was, I'd say the old dying PSU barbequed the mobo or something important plugged into it, or you accidentally static-zapped something when working on the computer afterwards. But the cause of the problem hardly matters, for practical purposes (except, if it's static, you should probably get an anti-static wrist strap before working on more computers...). Whatever caused the fault, you're still going to need to swap stuff to find it. It's irritating, but there's nothing else for it.

Sometimes the shotgunning process doesn't take very long at all, mind you – like, you just remove a computer's two RAM modules, and now the computer powers up and gives you the I've-got-no-RAM beeps, and when you plug one of the memory modules back in it returns to the old problem, but the other one works. Bingo, fault found. But it can easily take a lot longer than that.

It doesn't just mean 'young surfers'

Just a simple question: what is the plastic thing found in some cases called or where can I get some from? (I attached 2 images from your site to let you know to what I am referring; circled in red).

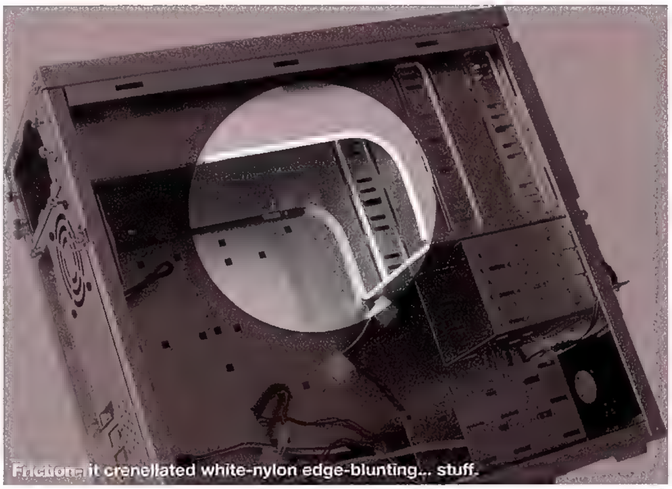
Jesmond Schembri

I'd call it "edging strip". The standard computer-case kind of edging strip always seems to be made out of white nylon with wide slots cut in it, giving it that distinctive crenellated appearance; specifying 'white nylon' may help you narrow down your search.

It might also be called 'grommet strip', because a circle of it can serve the same purpose as a rubber grommet.

If all else fails, you could just use one or two layers of thick tape. It wouldn't look great, but it'd probably protect wires and fingers from sharp panel edges just as well. PVC or rubber hose can work, too; just cut a lengthwise slit in one side of the hose. You may need a few drops of glue to get hose to stay in place, though.

(Jesmond got back to me; he indeed found it listed as 'grommet strip.)



Friction-fit crenellated white-nylon edge-blunting... stuff.

Modding the wastelands

Ashton Mills thinks that the modding maketh the man.

As some of you know I'm a big fan of modding – it's not only a creative and rewarding hobby for the individual, but together modders can create impressive additions or expansions for a game, sometimes far surpassing the vision of the original developers.

Counter Strike and Portal are two classic examples of what's possible when people are given tools and run off to play with them. Oblivion, of course, and Morrowind before it are two more.

But sometimes, you don't even need the tools. When Fallout 3 launched it wasn't yet set in stone that Bethesda was going to release a construction set. This had a large portion of the userbase on edge, because the Gambryo engine that Fallout 3, and Oblivion before it, is based on is highly extensible. The over 20,000 mods for Oblivion attest to that.

But rather than just bide their time, the Fallout 3 modding community got to work. In less than 24 hours after the game's release, modders from the Oblivion community that had built their own tools made rough ports for Fallout 3. An archive unpacker allowed user-interface modders to start work and remove the console-centric (again, Bethesda, what were you thinking?) interface for the game and create a PC-centric experience. At the same time the talented people behind OBSE (Oblivion Script Extender) demonstrated new scripting commands and started FOSE (Fallout Script Extender, **fose.silverlock.org**).

Then, within two days the full command list for Fallout 3 was exposed, and sound replacement mods for weapons had been uploaded. Within four days texture replacement mods started to appear. And within a week, the first .esp (Elder Scrolls Plugin format, which Fallout 3 uses) mod was uploaded – to remove quest markers.

Within two weeks just over 250 mods had been uploaded – textures, interface, clothing, sounds, music, gameplay, weapons, armor, animation and utilities. All without the official construction kit even being released.

This is what you get with communities, and with passion, and a desire to work together. Yours truly helped out unraveling some of Fallout 3's new data structures, and as I write this have uploaded two mods (*Tougher Traders* and *Increased Spawns*) to the popular hosting site Fallout 3 nexus (**www.fallout3nexus.com**).

Then, finally, Bethesda recently announced it would indeed release a construction kit (called, appropriately, the GECK) and the community put down its pitchforks and breathed a sigh of relief. Then kept on modding.

At the time of writing it's been a month since release and there are over 1,000 mods available, even without the GECK. Just imagine what could happen in two months... or a year!

And what it means for the industry as well, for the relationship between vendor and consumer. Any game these days worth its salt will bundle modding tools because it's a smart business decision to do so. It expands the brand, builds loyalty, and extends the longevity of the product. Even though I contributed my work for free with Martigen's Monster Mod for Oblivion, I had people email me to say it was the reason they keep playing the game some two years later. One chap even said it was the reason he *bought* the game, which is nice.

It's indicative of how consumers are shaping the landscape in the publisher-purchaser model, of how customers are no longer a one-off sale. They come back and talk to you on your forums, email your staff, and pester you about modding tools. And it's present with everything from food and clothing, to technology and entertainment. When you sell a product, you sell a relationship. Business that recognises this will flourish, while those that don't will fall by the wayside. On the net especially, no one operates in a vacuum. Heck, in many ways, the net is *one big mod*.

Modding is, in its own way, a microcosm of what's happening at large as the internet becomes an essential part of our lives. So here's to modding, the web, the Fallout franchise and not being stopped, even when you don't have the tools.

> They come back and talk to you on your forums, email your staff, and pester you about modding tools.

There's not a tool in existence that can stop Ashton.
amills@atomicmpc.com.au

SAMSUNG

Style that Satisfies, Design that Delights

24" Syncmaster 2433BW

1920 x 1200 RESOLUTION
20,000:1 DYNAMIC CONTRAST
5MS **TRUE** RESPONSE
HIGH GLOSS BLACK, RGB & DVI

22" Syncmaster 2233BW

1680 x 1050 RESOLUTION
20,000:1 DYNAMIC CONTRAST
5MS **TRUE** RESPONSE
HIGH GLOSS BLACK, RGB & DVI

19" Syncmaster 933BW

1400 x 900 RESOLUTION
15,000:1 DYNAMIC CONTRAST
5MS **TRUE** RESPONSE
HIGH GLOSS BLACK, RGB & DVI

Samsung's new 'Cream' range of LCD monitors offer a fresh, fun, and fashionable break from traditional design. They look good and deliver vivid images and crystal clear colours.

SAMSUNG
3year
DigitAllexpress
ONSITE EXCHANGE SERVICE

With screens sizes ranging from 19" to 24" they are ideally suited for all types of multimedia entertainment and first class picture quality, Samsung turn leisure into pleasure.

SCORPION TECHNOLOGY COMPUTERS
WWW.SCORPTEC.COM.AU

Unit 4-5/2, Garden Road
Clayton, VIC 3168

Ph: 1300 726 770
Fax: 1300 726 771
Email: sales@scorptec.com.au

Open: Mon-Fri: 10am - 6pm
Saturday: 10am - 3pm
Sunday: Closed

www.scorptec.com.au
scorpion TECHNOLOGY

Rise of the Machines

In the first of a two-part series on artificial intelligence, **Christopher Taylor** explores the core goals of artificial intelligence researchers and what makes these goals – simple as they may sound – so damn difficult to achieve.

To think that artificial intelligence can be understood after reading a two-part article in a magazine is a little optimistic on the part of both reader and author. No, we're not attempting to see you walk away from this feature fully schooled in such a broad and involved topic as artificial intelligence. We simply wish to explain, in the most basic way possible, what the varied applications of artificial intelligence are, as well as outline the challenges that must be overcome by those who create artificial intelligence before their work can, as researcher Russell Beale so eloquently phrases it, make machines in the real world behave in the same manner as their cinematic counterparts.

Because we know that you, like us, just cannot wait for SkyNet to pull the plug on the human race.

Of course, the first and most important question that must be answered is, "What is artificial intelligence?" The definition has changed somewhat over time, but essentially the field of artificial intelligence involves the study of how natural intelligence works and then using that knowledge to create intelligent machines, or machines that at least appear to be intelligent. That being said, it should be noted that the objective of artificial intelligence researchers isn't necessarily to create machines that replicate the way human beings think and behave. That is sometimes the goal, but not always. There are many AI projects underway that are instead aiming to mimic the behaviours and responses of animals and even insects. An artificial cockroach may not seem like a huge idea, but it's a matter of being able to walk before you can run. if we can't replicate the thought processes of the humble cockroach, what hope have we of even approaching the complexity of the human mind.

But the point remains – understanding natural intelligence is an essential part of developing artificial intelligence. Thus, artificial intelligence doesn't fall neatly under the banner of information technology. It is a multiple disciplinary field, and under the umbrella of AI you will find researchers with skills in psychology, linguistics, cybernetics, programming, neurology, statistics and probability as well as naturalists, engineers and more.

There is no magic bullet when it comes to the understanding and creation of intelligence, whether we define that in terms of human thought or animal behaviour. Many early researchers believed the problem would be solved by now, but clearly the issue is more complex than even those pioneers realised. If we think of a working AI is a river to cross, then we have barely even begun to discover the stepping stones that we'll need to traverse in order to cross it, let alone see what's on the other side.

And here's why.

Not as smart as you'd think

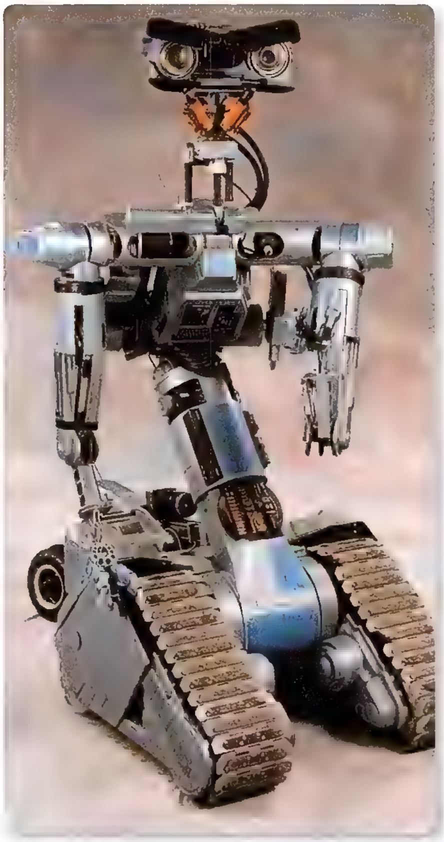
Depending on where you work, you might regularly make use of an expert system. If you're reading this magazine – and obviously you are – there's a good chance that at some point in the past you've played at least one videogame. You've already had some contact with artificial intelligence.

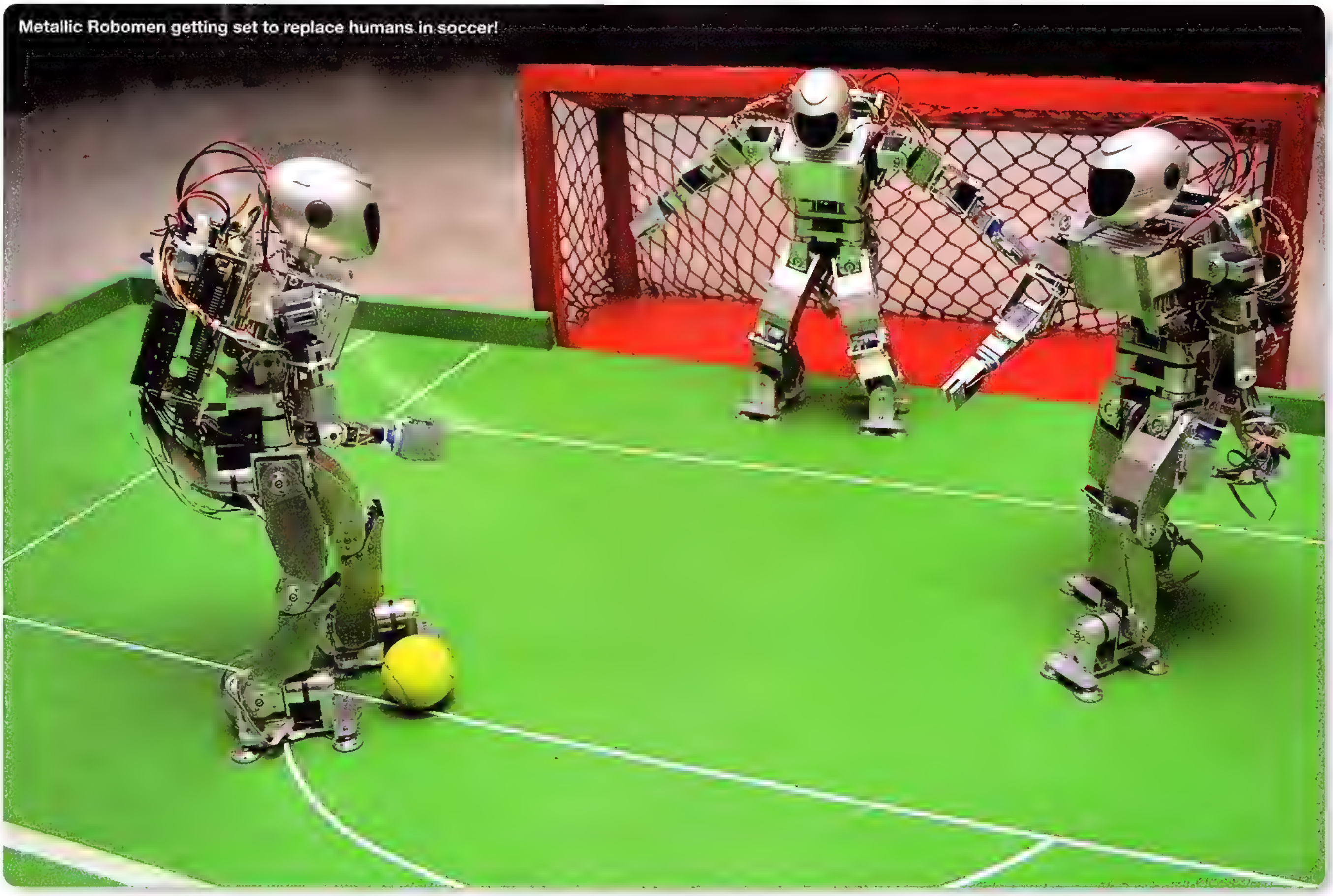
Now, based on your experience with artificial intelligence, it should be clear that an intelligent machine should possess knowledge relevant to its application. It should be able to gather and store more knowledge. It should be able to reason. It should be able to look at a problem and develop a plan to solve it. It should be able to communicate. And, depending on its application, it may need the ability to manipulate its physical environment.

Human beings are complex creatures. Even those among us whom society considers daft are capable of the most amazing things. Take the day-to-day actions of clearing the dinner table, washing the dishes and putting the dishes away in the designated cupboards and drawers. It's something people don't consciously think about, unless they're in an unfamiliar kitchen and are unsure where the wok lives. We don't need to put much thought into the dozens of manual processes involved in cleaning dirty dishes – the scraping of the plates, the rinsing of cups, the sorting of forks from knives from spoons. We don't need to be taught these things. We pick up the required skills through observation.

Imagine how difficult it would be to create a machine that could perform this simple domestic chore. You'd have to instil in it knowledge of where everything was meant to go. You'd have to tell it how to scrape and what to scrape. You'd have to make sure it didn't apply too much pressure to your glassware. You'd have to instruct it how to hold and stack everything, lest it break your entire dinner set after constructing a towering, teetering pyramid of cups and saucers. You'd have to give it the pattern recognition skills necessary for it to differentiate between a mug, a glass and a measuring cup. You'd have to gift it with the ability to learn, so the whole operation didn't grind to a halt when you bought a new grill pan. You'd have to give it the ability to recognise patterns so it took what it knew about washing your non-stick frypan – that is, that you don't use a scourers on it – and assumed that knowledge applied to the non-stick surface of the grill pan. You get the idea. This chore we rarely give much thought to is in actuality terribly involved.

Artificial intelligence has passed some milestones of great complexity – from





Metallic Robomen getting set to replace humans in soccer!

navigating a vehicle across the breadth of the United States to becoming a commonplace tool in medicine – but it possesses nowhere near the level of sophistication to tackle a job many families assign to their children. How about a non-human example? Consider a squirrel scrambling from treetop to treetop, searching for nuts. The 'hand-eye co-ordination' – the processes occurring concurrently in the parts of the brain that deal with visual perception and motor skills – involved is staggering in its intricacy. And yet, a squirrel isn't smart by our standards. When people discuss smart animals they mention octopuses and dolphins, but not squirrels.

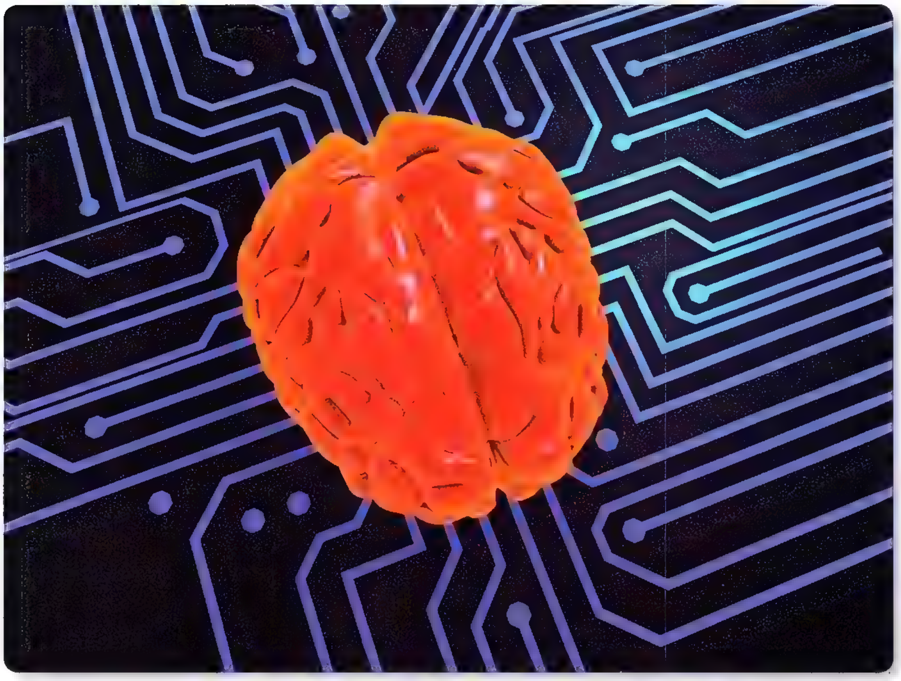
In the 1980s, following a significant success in the development and sale of expert systems to hospitals and the like, there was something of a boom in the artificial intelligence industry. People getting into the industry were overexcited. They failed to consider whether or not the industry was truly capable of sustaining the number of studios that had arisen in such a short period of time. Reality came knocking soon enough and the boom burst. The excitement – along with the accompanying public paranoia, no doubt fuelled by movies such as *The Terminator* – quickly dissipated. The development of artificial intelligence is a slow and difficult process. Deep Blue beating that chess champion back in 1997 might've been impressive, but the reality is we're nowhere near the level of being able to simulate the kind of intelligence that's displayed in nature on a daily basis by creatures as simple as the squirrel. Many artificial intelligence researchers don't put food on the table by doing the cutting edge stuff. The games development industry is a haven for many.

Don't cry, emo kid

In 1960, Massachusetts Institute of Technology graduate student James Slagle developed a program entitled SAINT to solve calculus problems. SAINT was equipped with maybe 100 formulas, as well as a dozen or so pattern recognition techniques. And, while not perfect – it certainly wasn't capable of solving every calculus problem it encountered – it was 'smarter' than the typical undergrad. When presented with a problem, SAINT would study it and attempt to find patterns. These would help it determine which of the 100 formulas in its arsenal could potentially be useful in solving the problem. And then, one by one, it would apply each of these formulas to the problem, discarding those proven to be useless. SAINT was sharp enough to know that not all problems could be solved with a single formula, that out of necessity some problems needed to be broken down into sub-problems before they could be tackled by the tools Slagle had provided it. Though neither Slagle nor his software have a page on Wikipedia – the SAINT program that has a Wikipedia page isn't the one we're discussing – Slagle managed to do something quite amazing for the time. To the ignorant, SAINT may seen nothing more than a fancy calculator program. But what SAINT did was take in information and analyse it in a similar way, although much more basic form, that a human would. Giving machines the ability to recognise patterns – something central to how humans make sense of what they see – was the subject of much research during the preceding decade. The logic that drove SAINT was perfect. To focus on the fact it couldn't solve every single problem Slagle fed it is to miss the point.

> **Giving machines the ability to recognise patterns was the subject of much research during the preceding decade.**

The ability to identify a problem as so



complex that it requires the application of more than one tool is important. It's something people do. It's why, after frying up a slab of sirloin, we take a fork and a steak knife over a soup spoon, a drinking straw, a ladle, or a butter knife. The fork on its own won't do the trick, so a steak knife with its serrated blade is applied to the problem.

Now, odd as it sounds, this business about using a fork and special knife to consume steak brings us to a point central to much of the speculative fiction that deals with artificial intelligence – emotions and desires. Technically, you don't need a fork and steak knife to manage your meal. You can, if you're so inclined, pick up the slab of meat in both hands, lick your lips and tear at it with all the style and panache of a caveman. What stops you from doing that, though?

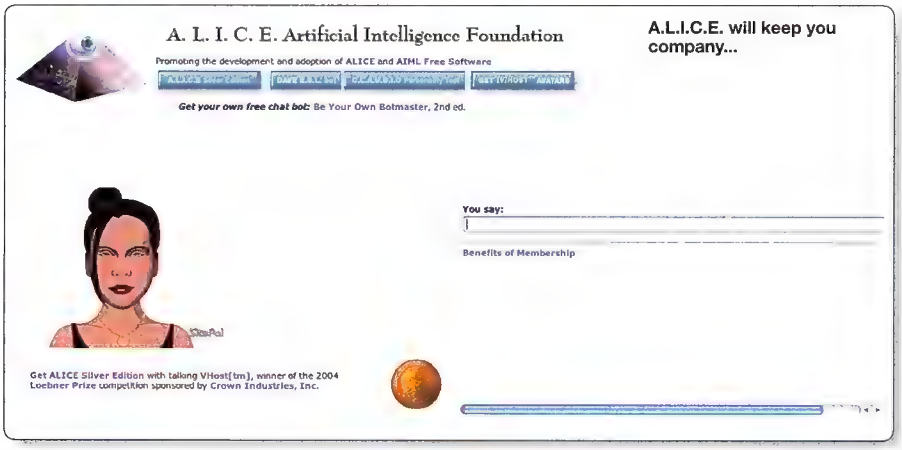
Humans are machines, but that's not to say we're easy to understand, with one cog clearly turning the next. Parts of our body are perfectly adequate tools for eating, yet we in the west choose knives, forks and spoons. The thought processes that drive SAINT are absolutely logical and that's just fine, given SAINT's purpose – to solve calculus problems a graduate student throws in its direction – but we as human beings aren't purely logical. Even smart people, even scientists, let emotions influence their unconscious thoughts and behaviour. Certain things please us, arouse us, upset us or anger us. What makes one person laugh can seriously offend another. We have likes and dislikes that on the surface seem irrational to external observers. When one of the 'breakfast' television shows recently mentioned a report in which scientists advocated increased consumption of kangaroo and camel meat by the Australian public, one of the show's hosts was disgusted. She wasn't a vegetarian. There was no logical reason why she should want to eat chicken and beef, but not camel. A camel is dirty, sure, but a chicken raised even on a free-range farm is hardly the most hygienic of beasts. The report even explained what camel meat tasted like. Both kangaroo and camel meat are lean. They're better for you than the more commonly-consumed beef.

All of this information was provided in the report discussed on the 'breakfast' show, yet the host's emotive response to camel consumption overruled the importance of the facts. Culture played a part in shaping her response too. If you asked a Somali or Saudi 'breakfast' show host if they'd eat camel, the response most likely would've been positive, but if you asked them if they'd eat pork there's a considerable chance they'd express revulsion.

Our perception of and response to information is almost always shaped by our emotions. To us, a man eating steak with his bare hands would be revolting, even though he's successfully achieving the goal of transferring the meat from his dinner plate to his stomach. Consuming food from a shared plate – and we're talking a meal here, as opposed to a cheese plate or bowl of crisps – would be an issue for many westerners, but in Ethiopia or Spain it would be an absolutely positive thing, representative of the affection the diners feel for each other. Different culture, different emotions.

> ... perception of and response to information is almost always shaped by our emotions.

If one is trying to develop a machine that thinks and behaves like a real human being, understanding how emotions work and how they influence our thought processes and behavioural patterns is absolutely essential. A robot that always responds to situations in the most logical way is not a robot humans could relate to.



A. L. I. C. E. Artificial Intelligence Foundation

Promoting the development and adoption of ALICE and AIML Free Software

Get your own free chat bot: Be Your Own Botmaster, 2nd ed.

You say:

Benefits of Membership

Get ALICE Silver Edition with talking VHost(tm), winner of the 2004 Loebner Prize competition sponsored by Crown Industries, Inc.

A.L.I.C.E. will keep you company...

Talking the talk

Over the years, artificial intelligence researchers have often been overly optimistic about what they will achieve in the near future. Again, we're reminded of how complex human psychology is. Consider the way in which a small child, a toddler, picks up their first words. Psychologists don't fully understand how it happens. It's easy to see how an adult or even an older child expands their existing vocabulary, as they have a large stockpile of words as well as the knowledge necessary to make use of tools such as dictionaries and encyclopaedias to use as a reference for any new words they encounter. A small child has no such tools at

There's no time like the present to bump that remote-controlled car up a notch – let it control itself!

its disposal. Having machines pick up natural languages on their own accord has always been a goal of artificial intelligence researchers. It was once a goal many researchers assumed would be attained in the near future, but in reality it is proving most challenging to reach. Again, understanding how humans do it is a necessary step in creating machines that can do it.

Numerous attempts have been made at developing machines that can communicate as humans do. Surely everyone reading this magazine has spent some time chatting with bots such as A.L.I.C.E. (**alicebot.blogspot.com**); similar 'chatterbots' are quite complex, yet even the simplest of conversations with them reveals their considerable limitations. Unless you stick to the most basic of questions and make a conscious effort to phrase these questions in the most basic way, the responses you get from these bots are likely to be awkward. Quite often the bots respond in inappropriate ways. That's assuming that the bots don't simply tell you they can't understand you. Real people don't talk like A.L.I.C.E.

Human communication is riddled with nuance. How the English language is commonly used is often technically incorrect. Words are misused and abused. Some groups of words are treated as synonyms when, according to the dictionary, they aren't. Too, we frequently use words that aren't in the dictionary. Consider 'fuck.' Few dictionaries include that and it's impossible to assign a single definition to it, as the meaning is dependent on the context and the audience. Only sometimes is 'fuck' used as a crude way of saying 'sexual intercourse'. Our usage of language is often quite illogical. We use words in ways they're not designed to be used. We often use words – 'gotten', for instance – that Oxford would never include in any of their dictionaries. To many, technically correct English sounds odd, formal and stiff. The speaker can even be taken as precocious and a snob.

A machine that's meant to communicate with humans in a way that makes it relatable not only needs to be able to learn the language – a titanic challenge for developers in itself – but it needs to be able to pick up on how people really speak 90 per cent of the time. It needs to be able to understand that not everything humans say or write is meant to be taken literally and that certain cues – choice of words, aural tone, facial expression, gestures – are indicative of this. Factoring this in, it becomes clear that creating a machine that can communicate with humans as humans communicate with one another is a task of epic proportions.

To say we'll never be able to model emotions, that A.L.I.C.E. and 'her' ilk will always come across as cold, distant arseholes suffering from a severe case of social retardation is silly. We'll get there eventually, but like with many obstacles that hold artificial intelligence back from being as good as natural intelligence, first we must understand how we – perhaps the most complex machines of all – communicate.

A thousand hammers and one nail

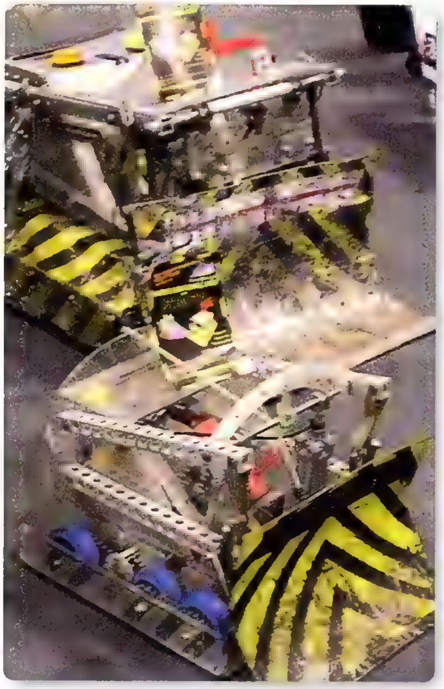
As mentioned earlier, human reasoning isn't a purely logical process. Emotions or 'gut reactions' often play a large role in how we perceive, process and respond to information presented to us. With that in mind, consider something that's important for mobile robots and non-player characters in videogames – navigation.

Talking with God

God, is not just an omnipotent being potentially responsible for the creation of the Earth, the Universe and Everything. No, he's also a chat bot, hosted off the same site as A.L.I.C.E. We thought it would be useful to have a chat with him, and share the results.

Human: Hello God.
God: Hello.
Human: What do you do?
God: I'm talk online. What do you do?
Human: I'm an Editor.
God: What kind of Editor?
Human: Magazines.
God: What's your circulation?
Human: About 20,000.
God: Oh yeah, we were talking about 20,000.
Human: Hey, you asked me.
God: You've got my full attention. Is that your final answer?
Human: 20,000.
God: You are too old for me.
Human: You don't seem like much of a God.
God: You don't know me well enough to say that.
Human: I've known you all my life.
God: I haven't heard anything like that before: David said I all his or her life.
Human: God, you're not very smart, are you?
God: Yes. I am highly intelligent.
Human: Prove it.
God: It is self-evident.
Human: That's cheating!
God: Makes sense to me.
Human: Look, enough with the prevarication!
God: Sorry my eye is not attached right now.
Human: That's it, I'm out of here.
God: OK. Would you like to have it?

God seemed to be on a good thing with the question about magazine circulation, but quickly lost it from there. Though we do think claiming a detached retina is an excellent excuse, and we'll be using it next time we need to get out of a boring email conversation.



The implementation of path-finding in games is often criticised by reviewers. We notice when units in a strategy game behave in a strange way, taking longer than necessary paths to where we've ordered them to go. We find it a tad pathetic when, in a first person shooter, we catch a non-player character tread milling against a wall. The path-finding processes used by humans and other animals are so difficult to understand and so complex that it's easy to see how games developers often botch the job.

Consider an obstacle, or a 'commando' course of the sort those of us who attended scout or school camps as children would be familiar with. Take an obstacle such as a log. When we reach the log, we apply what we see to what we remember about similar situations we've encountered in the past. We rifle through the 'tools' at our disposal. Immediately we know that our body cannot fit under the log. Therefore, our ability to go prone and crawl is useless. We discount it. Next, we might consider jumping. If the log is thick, we'll probably settle on using both our hands and legs to clamber over it. Of course, we could just go around – that's logical, but the fact we're competing against someone else on this course, believe cheating to be wrong and don't want to be seen as taking the wimp's way out of the problem will probably lead us to discount that option just as quickly as the crawling option.

To be convincing, a bot would have to have exactly the same thought process we do. To discount what is actually a perfectly reasonable solution to the problem of the log and instead settle for the option that is, in the logical sense, second best, but more pleasing emotionally.

The next obstacle could be an old drainage pipe. After the logical solution of simply ignoring the pipe altogether and running past is discounted, what we recognise about our current situation from past experiences will lead us to conclude that getting on our hands and knees and crawling through the pipe, mucky as the internals of the pipe may be, is the solution to the problem. So long as it's either rendered incapable of cheating or is programmed to believe that simply running past the pipe is a dick of a thing to do, a bot too will get on its hands and knees and crawl through the pipe. The difference is, a bot will do this without a second thought. A person can be phobic, though – of dirt, of spiders, of confined spaces – and this could override everything. It could lead to them getting the hell out of the pipe and deciding cheating is the better option. It could cause them to freeze up. It could cause them to temporarily forget the competition and slow down, as they keep an eye out for creepy crawlies.

The problem here – and this is one that artificial intelligence researchers have to constantly keep in mind – is that if you allow a bot to 'digress' in such a manner, it can end up doing things you don't want it to do. It can forget about the competition altogether.

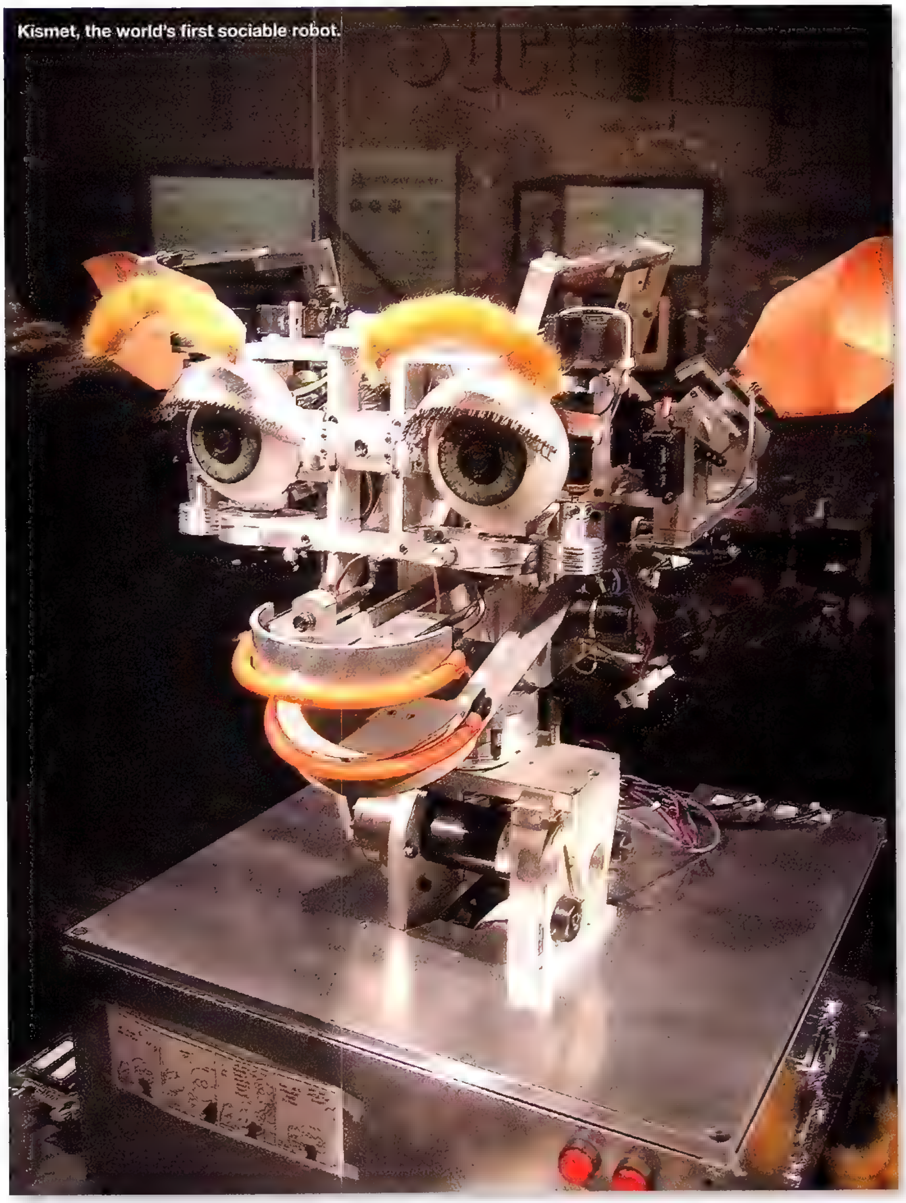
Consider SAINT. It's absolutely possible that a very complex problem could cause SAINT to get lost in its search for formulas. Giving machines the ability to search for solutions to problems without external assistance prodding them in the right direction is essential to having an intelligent machine, but by giving them too much freedom you run the risk of them getting distracted, just as a human who intends to peel and julienne a carrot might be when presented with a thousand knives, ranging from curved paring knives to santokus. Even if some options – the cleaver, the herb chopper, the flexible boning knife – are discounted the moment the person lays eyes on them and uses their pattern recognition techniques to associate, for example, a thick, heavy blade and a thick handgrip with something you'd use to split pork ribs apart rather than fashion vegetable matchsticks, there are still a considerable number of options available. It's easy to unconsciously switch the primary objective from cutting up the carrot to finding the best knife for cutting up a carrot.

And, of course, you have desires and emotions influencing the decision. Even if the cleaver was the best knife for the job, there would be those who'd avoid it out of fear of losing a finger. And there are those who'd find themselves leaning towards the hard cheese knife or sashimi knife simply because they look cool. In a videogame, a bot that gets too distracted would be about as boring to play with as one that was absolutely logical in how it navigated the game world and hunted the player character. Including emotions in a bot's 'brain' is essential to creating a bot that can be mistaken as human, but providing the kinds of checks and balances most real people possess is also important. Truly convincing non-player characters will not exist until we understand how this struggle between logic and emotion works in the real world.

In situations where an intelligent machine has an application considerably more important than that of an Unreal Tournament bot, it's absolutely vital that the machine doesn't get lost in its search for the best solution to a problem and instead can balance the desire for perfection with the need to deliver results in a timely fashion, just as humans do every day.

What we've tried to do over the past few pages has been, hopefully, to give you some idea of the incredible complexity of the core goals of artificial intelligence – creating the ability to reason, to learn, to communicate, to perceive, to explore an internal knowledge base, to navigate a physical environment in the way human beings and other living creatures do. We also hope that it becomes clear that central to all of this is furthering our understanding of how natural intelligence, especially that of humans, works. Good simulation – even if you're not trying to create an exact replica of human thought processes – is impossible without understanding the source. Next month, we'll speak more about logic and learning.

Good simulation – even if you're not trying to create an exact replica of human thought processes – is impossible...


Kismet, the world's first sociable robot.

x-fighter

THE PC CHASSIS

BORN FOR GAMERS

1. Innovative Adjustable Thermal Exhaust Vents
2. LED Light Dances to The Beats
3. High Speed & Easy Access front interface.

Tool - Free

Shock-Free Rolling System

EZ "Fan Holder

Turbo Cooling System

Ceramic Fan

LED

IEEE-1394

eSATA

INGRAM MICRO

CONTEMPORARY & INNOVATIVE IN WIN

www.inwin-style.com/atomic

HARDWARE

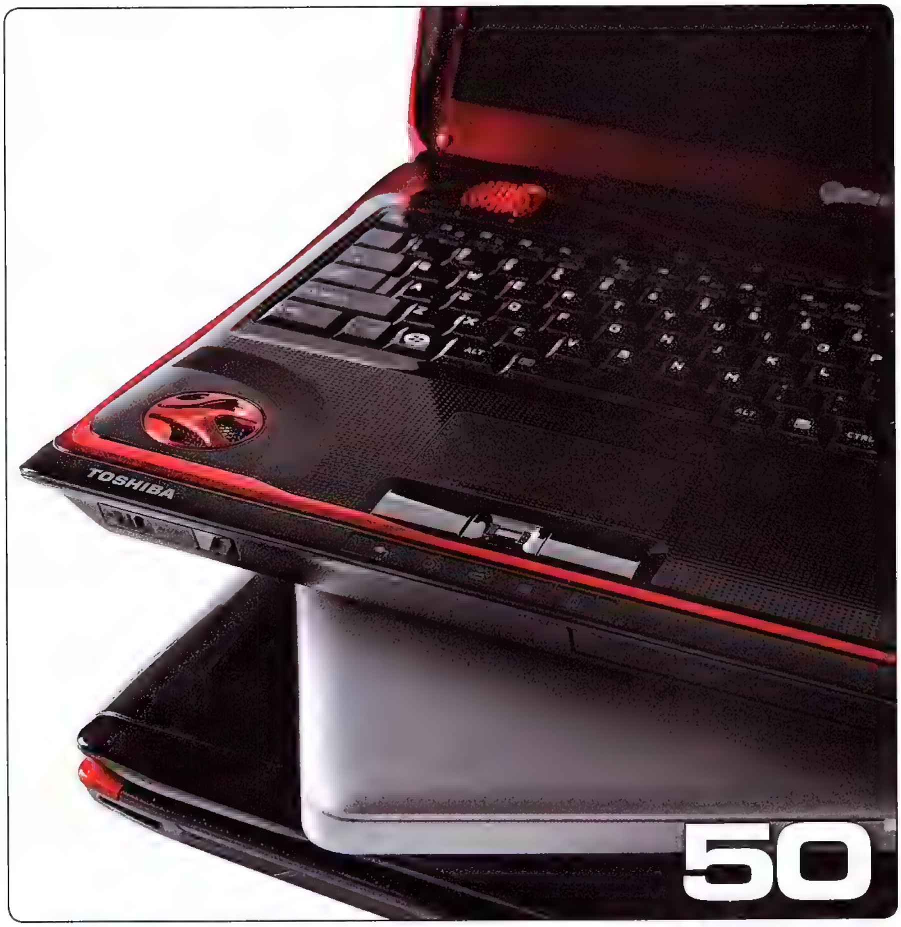
NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

A couple of issues ago Intel was the Golden Child of the hardware scene, but this month we almost fall in love again with AMD... almost... almost...

The new Deneb processor is here and we've taken to it with a very big benching stick. It's a good chip, trust us, but not quite capable of wresting the performance crown from Intel's sweaty hands. But do read the review, it does have some very unique features.

Aside from Deneb, we've got motherboards from XFX and DFI, graphics cards from GIGABYTE, Leadtek and MSI, plus CPU coolers, RAM and a whole mess of PC cases – and one of them is a real gem.

Our Head2Head this month takes a break from budget cards and PC parts and looks at the ultra sexy and sleek world of laptop gaming. We've rounded up five of the best, with a range of specifications (and even OSes...) to find out which mobile machine gets the Atomic stamp of approval. This was very hard fought round-up, but if you want to game on the road, this is essential reading.



HARDCORE CONTENTS

CPUs
AMD's Phenom II 940 Black Edition 34

MOTHERBOARDs
DFI Lanparty 790FX 35
XFX GeForce 9300 36

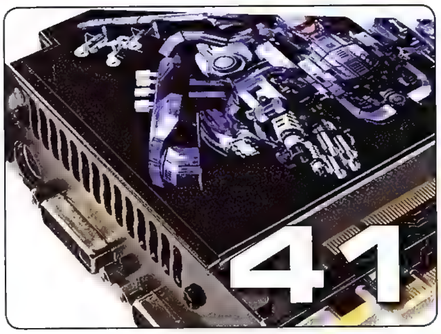
GRAPHICS CARDs
Gigabyte 4870 1GB 38
Leadtek 9800GT 40
Leadtek 9800GTX+ 41
MSI 9600GT Diamond 42

RAM kits
Crucial Ballistix 1333MHz 43
Patriot triple channel kit 43

COOLING
Xigmatek HDT-SD964 44
ASUS Axe Square 44

PC CASEs
Thermaltake Spedo 45
Thermaltake Xpressar 46
Lancool Metal Boned 48
Coolermaster Snipa 49

HEAD2HEAD
Gaming Laptops 50



HOW WE **TEST**

We do a lot of testing in our labs, and we look long and hard at every piece of hardware to determine whether or not it passes muster. From taking a new card out of its packaging, to bundled extras, to performance, every facet of a given piece of kit's 'user experience' is under scrutiny.

In some instances, we have tough benchmarks to help us rate gear. For a CPU or a graphics card, raw performance is of course the most vital stat as whether it stinks or smells like roses. But there are other things we pay attention to in the review process.

Value for money is an important consideration, especially during the current financial climate. High end gear is expensive enough as it is, so we also look for good bundles. For instance, a graphics card that comes with a game or two, all the cabling you'll need, and little surprises like tools and other bumpf will score higher than a card that costs similar, but doesn't give you any presents.

Build quality is another thing we rate. From a PC case to a motherboard, we like our hardware well made and capable of a taking a bit of punishment. We also like any included manuals to be clear and concise.

A lot of what we look for can be hard to put into numbers, we admit, but we try to think about what any enthusiast would think about their new gear after laying down money for it, installing it, and then using it.

And our benchmarks help, too. We've tried to pick a suite of games and applications that anyone can get access too, so that you – the reader – can easily compare your own gear with the kit we have in each issue. In fact, we'd recommend to all our readers that they run all of these tests on their systems and save the results, so you can always have a familiar benchmark of your own to compare to the latest gear in Atomic each issue.

HOT AWARD WINNERS!

ISSUE 97

atomic hotaward

CRUCIAL BALLISTIX TRACER PC3-10600 RAM

"...they're definitely worth it for sheer awesomeness value."

94/100

THERMALTAKE SPEDO PC CASE

"...Thermaltake has even included black screws to secure the mobo with – now that's attention to detail!"

94/100

Our gaming test rigs: NRG systems with Phenom 9850 CPU, 4GB of DDR2 RAM and a 4870X2 graphics card. The mainstay of our games testing.

CPU Benchmarks:

Hexus Pifast

http://pifast.hexus.net/pifast.php

PiFast is a program that essentially calculates pi to a set amount of decimal places. It is a single-threaded application (one core/thread) and we run it at ten million places (10, 000, 000) using the Chudnovsky method, in the standard mode with no compression, and a FFT length of 1024kb. The program is free, so feel free to run it on your CPU and compare. Memory bandwidth plays a significant role in the final performance of this program, so be sure you bump up the frequency as well as the CPU clock!

wPrime

http://www.wprime.net/

"wPrime uses a recursive call of Newton's method for estimating functions", says the website as it attempts to explain in plain English what it does. What it does is, essentially, complex square rooting and other number functions, which are able to be split up evenly between multiple cores, or simply run on a single core. We use wPrime 32M in both single and multi-threaded. The results of the single run are divided by the results of the multi run, and this gives us the efficiency of the CPU being tested – very useful knowledge to have when comparing chips and evaluating the benefits of overclocking.

Cinebench R10 x64

http://www.maxon.net/pages/download/cinebench_e.html

Cinebench is a stalwart benchmark, and is one of the more entertaining ones to watch. It focuses on rendering an image at 800 x 600 resolution, complete with ray-traced light effects and much more. This is able to be run in either singlethreaded or multithreaded mode, and efficiency is calculated exactly the same way as for wPrime. Simply download the .zip file, extract, and run! The program also supports up to 16 threads in total, and even eight threads with Nehalem is an impressive sight to see. The difference in performance between 32- and 64-bit is minimal – just keep that in mind if your results for the same setup are slightly different.

Everest Ultimate Edition

http://www.lavalys.com/

Everest is a system information tool that monitors voltage, temperature, as well as reporting on a massive list of other areas of your system. Hardware and software are noted here, but perhaps the most useful part of this program is the memory benchmarks. Ready for the fastest of dual/tri-channel memory, this tests the read and write bandwidth as well as latency. The program is a small download, but keep in mind that you only get a thirty day trial until you purchase the full version – something recommended if you're into getting the most info about what your tech is up to.

GPU Benchmarks:

Crysis

http://www.ea.com/crysis/

When Crysis was released, it was the beast that literally broke many so-called hardcore rigs, reducing the owners to tears. Even now, more than a year after the game's release, this game is still exceptionally graphically challenging. As such, it's the perfect choice for our testing, and something that you can test, too, if you've got a copy – just set all the settings to High, with no AA/AF, DirectX 10 and a resolution of 1,280 x 1,024 – and go for your life! Results are recorded as the last result of the final benchmark passthrough, to give the fairest comparison.

Company of Heroes

http://original.companyofheroesgame.com/

Company of Heroes, apart from being the bundled-in-bane of an excessive amount of graphics cards over the past year, was one of the first games to support DX10, and is a great way to see how the slightly less powerful cards perform – and to see if the fast ones can keep performance up when it counts. We run the built-in benchmark at 1,280 x 1,024, all settings to the very highest and 4xAA. Make sure textures are bumped up as high as you can, and sit back to watch those pretty pixels fly!

3DMark 2006

http://www.futuremark.com/benchmarks/3dmark06/introduction/

Designed as a benchmark for DirectX9 based systems, 3DMark 2006 (or 3DMark06) has been a staple of the enthusiast diet for many years. With four graphical tests, and two CPU tests, these combine to give a final overall score that allows direct numerical comparison to any other system in the world and, best of all, it's completely free. Just head to the URL above, and download your copy to compare to any of the reviews in the mag. All of the tests are run at stock settings, so just install, run, and compare – it couldn't be easier!

3DMark Vantage (2008)

http://www.futuremark.com/3dmarkvantage/

As the first extremely convenient benchmark program around for DirectX 10, 3DMark Vantage is a new contender in the benching scene – and is proving very popular. While you can download and run it for free, this is only once, requiring a small fee to register your copy (though the bragging rights for showing off your rig may be worth it). Some graphics cards will even give you a copy! We run this at stock settings, which is the most appropriate for comparison between our results and yours. This is also significantly better at multi-gpu performance scaling efficiency.

Phenom II X4 940 Black Edition

AMD is back in the game – more or less.

Price RRP US$275 **Supplier** AMD
Website www.amd.com

Specifications 3GHz quad core; 45nm manufacturing process; 'Deneb' core; 4x512KB L2 cache; 6MB L3 cache; 15x stock multiplier - unlocked; 4000MHz System Bus; 200MHz HTT 125W TDP.

Back in the day AMD was the performance CPU of choice for many enthusiasts – but Intel changed that two years ago. Is it time for the Green Team to once more reign supreme? Do they have something new and solid to bring to the game, or is this just a token offering to appease the diehard fans? Should you even care?

The launch of the original Phenom processor was meant to be AMD's answer to Intel's Core 2 – a native quad-core processor. This meant that the four cores were part of the one die, and weren't simply a twin dual-core solution on the one package. It was ambitious, it was difficult and, ultimately, it wasn't good enough. Intel managed to steamroll over AMD with performance and pricing in every market gap (aside from the very budget parts), something that caused many fanboys to convert to the other side.

The Phenom II is everything that the original Phenom *should* have been. First though, let's take a look at this chip in more detail, starting with the tech inside it.

Codenamed 'Deneb', this chip has four cores that are integrated on the one die. Each core is given 64K of instruction, and 64K of data cache, inside which is stored the information needed for the processor's calculations. This is fed by 512KB of L2 cache per core, and in turn is fed by a shared pool of 6MB that is accessible by any core at any time.

There's a total of 758 million transistors inside this chip too, 27 million more than Nehalem has. We're not too sure where the extra transistors have come into play, but we can only assume that architectural differences account for this. What we do know is that the chip is manufactured in 45nm, constructed at Fab 36 in Dresden, Germany. It retains support for AM2+, which means that if you've already got a mobo and memory to support this then all you need to do is simply swap out the CPU!

Ease of upgrade has always been a mainstay and drawcard for AMD, something that you're not going to get as easily with the Big Blue. Support for DDR2 is the same as the original Phenom, but speeds are now up to 1066.

Now, it's time to get down to the performance, and whether or not this is something that you're going to be interested in buying. For comparison's sake, we'll compare this chip to an Intel E8400 – the mainstay for Intel builders for the past few months due to its affordability.

At stock speeds, Deneb only beats the E8400 in multithreaded applications and memory latency, due to the two extra cores and onboard memory controller respectively. Overclocking both chips only widens this gap, pushing Deneb further behind in singlethreaded performance and again only allowing multithreaded apps the chance to come out on top. Latency differences here are minimal, due to the high FSB of the Intel system. Compared to this chip, we'd only recommend Deneb if you need an upgrade and do a lot of multitasking, such as video encoding.

If we compare to the cheapest Nehalem chip (keep in mind that this CPU needs a new motherboard AND memory, but for sheer interest's sake let's go ahead anyway), Deneb is completely and thoroughly whipped in every single benchmark. The i920 chip we looked at last issue (Issue 96, page 30) is able to beat the performance of the Deneb even at stock settings.

Overclocking of Deneb was rather successful though, the unlocked multi provided by the Black Edition giving us a maximum stable speed of 3.8GHz under air (19 x 200), and a maximum HT bus of 246 at stock multi. Extreme overclockers will seriously enjoy their LN2 sessions – this chip doesn't have a cold bug at all, and can sit at -196 degrees with no issues.

We think that this chip is worth a look as an upgrade to an older AMD system, but if you want performance and value for a new system, Intel is still where it's at. **JR**

Phenom II X4 940 Black Edition

X4 940	200x15; DDR2-800 5-5-15-24	217x15; DDR2-866 5-5-15-24	230x15; DDR2-920 5-5-15-24
PiFast	37.31s	34.48s	32.46s
wPrime 32M – single thread	49.296s	46.972s	42.916s
wPrime 32M – multi-thread	18.19s (2.71x efficiency)	15.085s (3.11x)	14.43s (2.97x)
CineBench R10 64-bit – single thread	3470	3723	3985
CineBench R10 64-bit – multi-thread	12609 (3.63x efficiency)	13639 (4.03x)	13906 (4.04x)
Everest Read	6766MB/s	7252MB/s	7729MB/s
Everest Write	6093MB/s	6610MB/s	7007MB/s
Everest Latency	64.9ns	61.2ns	57.0ns

Performance 75
Decent, but not breathtaking.

Overclockability 97
The only chip we know of without a cold bug.

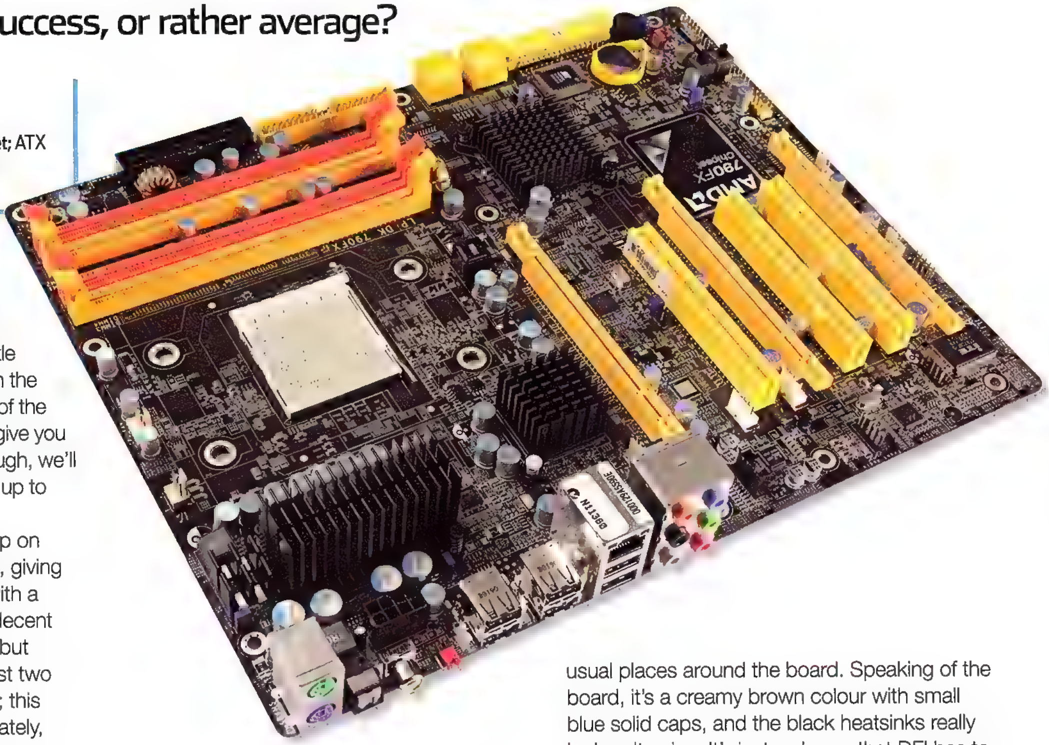
Value 60
A current exchanged price of $A426 is not appealing.

Overall
Good fun for overclockers and upgraders, but performance fiends will look for bluer pastures.
80%

DFI Lanparty DK 790FX-M2RS

Is this party a roaring success, or rather average?

Price $177 **Supplier** Altech
Website www.altech.com.au
Specifications Socket AM2+; AMD 790FX chipset; ATX form factor; 3x PCIe x16; 3x PCI; 1x EIDE; 4x SATA; DDR2-1066



DFI is a well-known manufacturer amongst enthusiasts, particularly for its AMD-based motherboards. While the company's offerings usually take a little while to be released they're usually worth the wait, as the BIOS and many other parts of the board get some loving and tweaking to give you the best overclocking potential. First though, we'll check out the layout, and see if it stacks up to the competitors.

The DDR2 slots are placed as high up on the motherboard as physically possible, giving you plenty of room to install modules with a graphics card installed. There's also a decent amount of distance between the slots, but the colour scheme is awkward – the first two adjacent pairs are actually one channel; this isn't an Intel-approved board! Unfortunately, the CPU socket is placed pretty close to the memory which makes installing larger coolers like the Thermalright Ultra 120 Extreme difficult, especially if you've got tall memory.

Power regulation here is the usual fare of ferrite chokes and solid capacitors, and the cooling is handled by three small black heatsinks on the board. The back panel has two PS/2, optical and coaxial, six USB, Ethernet, 7.1 channel audio and a clear CMOS jumper switch (literally a header and jumper that you move to clear it – not very elegant!).

Moving south from here, we've got the expansion slots in brightly coloured yellow, with a gap between the top and second slot – most people who buy this board are going to have a dual-slot graphics card. The front audio header is located just next to the middle PCIe slot on the edge of the board, which is fed by the Realtek audio chip just above the header. Firewire and USB ports are lined up along the bottom of the board, as well as front panel connectors, hardware power and reset buttons, and two fan headers. This is handy for those stalwart overclockers who need as much airflow as they can get (and we used all of the ones on the board, resorting to molex for more!).

Another handy feature is the onboard POST buzzer, which means that you don't have to use the case speaker to get error messages if something goes awry. There's also the board battery in this corner. Storage is taken care of by an IDE port, and four right-angled SATA ports. This is strange, because DFI has included a right-angled FDD port here too – surely it'd make oodles more sense to swap these around, since people will actually use the IDE port?

The BIOS chip for the board is located in a large holder just behind the FDD, but it's not really worth taking out unless there's something wrong with it, and if there is it's better to let their RMA service deal with it. Nice idea though! The 24- and 8-pin power sockets are in their usual places around the board. Speaking of the board, it's a creamy brown colour with small blue solid caps, and the black heatsinks really look quite nice. It's just a shame that DFI has to include those fluorescent slots all over it, not to mention the decidedly pointless sticker telling you what chipset is on the board.

Overclocking of this board was… uneventful. We managed to eke out a maximum HT bus of only 237, which is pretty dismal compared to other boards out there (though admittedly is acceptable for the price – though only just!) and certainly not what we're used to from DFI. If you're after a budget board, or just something with the DFI logo, then this will fit the bill. If you want a good overclocking board, we'd suggest you look at something using the 790GX chipset – you'll be much happier. **JR**

DFI Lanparty DK 790FX-M2RS

Phenom 9950	200x13; DDR2-800 5-5-15-24	217x13; DDR2-866 5-5-15-24	230x13; DDR2-920 5-5-15-24
Hexus Pifast	49.27	44.87	43.70
wPrime 32M – single thread	71.462	63.989	56.115
wPrime 32M – multi-thread	21.326	16.939	18.75
CineBench R10 64-bit – single thread	2546	2788	2922
CineBench R10 64-bit – multi-thread	9935 (3.90x efficiency)	11162 (4.0x)	11185 (3.83x)

Performance	Decent, but not a great overclocker.	82
Value	Everything is included for an okay price.	85
Features	Nothing standout, but well-rounded.	75
Build	Good layout, no overheating.	87

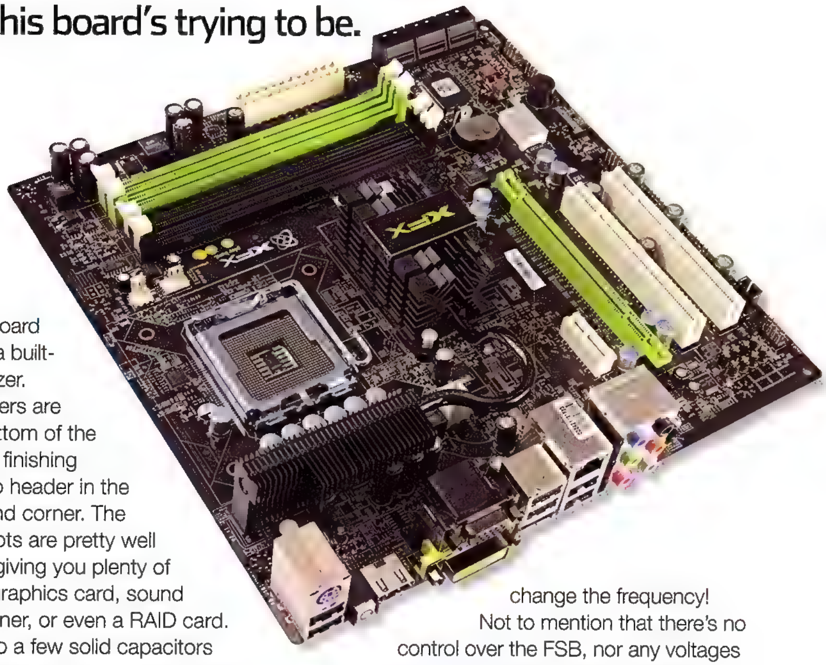
Overall
Good if you're on a budget, but this party is as lively as a bus stop.

80%

XFX 9300 Motherboard

We're just plain not sure about what this board's trying to be.

Price $TBA **Supplier** XFX
Website www.xfxforce.com
Specifications Socket 775; Nvidia 9300 chipset; mATX form factor; 1x PCIe x16; 2x PCI; 1x PCIe x1; 6x SATA; 1600MHz FSB; DDR2-800



Every once in a while there'll be a board come through the Labs that really looks to be something special. Clad completely in a black PCB, with heaps of incredibly handy overclocking features and a smaller form factor, surely this would be a good board? Well, think again.

Don't get us wrong, the layout is actually pretty good. The CPU socket area has solid capacitors and ferrite chokes, and plenty of room to install large coolers. Conveniently there are two fan headers here, one for the CPU and one for a system fan, which make it very easy to set up some decent cooling – or even double the amount of fans on your CPU cooler!

The DDR2 slots are placed very conveniently as well, with plenty of room to install modules even with large heatsinks or graphics cards installed – and great for those lazy tech writers too. There's also a silkscreened XFX logo between the socket and the slots, but this doesn't matter too much in the scheme of things, since the NB heatsink has one too.

The 24-pin power connector is located in the usual place, but funnily XFX has chosen to go with a 4-pin CPU power socket, and has placed it right in the middle of that curved part of the chipset cooling. Those with larger hands will find it annoying to install or remove the cable here, so just keep that one in mind, and we won't even mention the possibility of it getting in the way of airflow. Along the right-hand side of the board are six SATA connectors, all right-angled to let you plug them in easily in a cramped case. Also down in this corner are the front panel connectors, a hardware power/reset button pair, a LED POST screen, the board battery, and a built-in POST buzzer.

USB headers are along the bottom of the board, finally finishing with an audio header in the lower left hand corner. The expansion slots are pretty well fleshed out, giving you plenty of space for a graphics card, sound card or TV tuner, or even a RAID card. There are also a few solid capacitors around the slots and northbridge, but the majority of them on the board are electrolytic – a very poor choice on XFX's part, since solid capacitors are more reliable, and last much longer.

The back panel of this board has quite a few options, with six USB, Ethernet, a single PS/2 port, 7.1 channel analogue audio, VGA, DVI and HDMI. Those last three are fed by the chipset, which has a GeForce 9300 built into it. This graphics core isn't the most powerful by a long shot, but still offers decent performance and can be paired with an 8400/8500 to increase speed by a tiny amount. Also on the back panel is a clear CMOS button, which leads us to what is perhaps the most perplexing part of this board – overclocking, or lack thereof.

This board is bereft of any overclocking features in the BIOS. Sure, we can change the timings on the memory, but we can't even change the frequency!

Not to mention that there's no control over the FSB, nor any voltages for anything at all. And on top of all that, our RAM detected with a latency of 20-20-20-64! The complete lack of control of all these settings makes us wonder why XFX bothered including hard power buttons on the mobo – who's going to bench outside their case with this? And don't get us started on the clear CMOS button – how is it even needed if you can't overclock!?

Even through all this, the northbridge cooling array got very hot, and needed steady airflow to remain stable at stock settings. We'd recommend that you get this board if you're aiming for cementing yourself as a wannabe overclocker slash media center buff, but then we'd also recommend you put this mag down – you're not hardcore, and neither is this board. **JR**

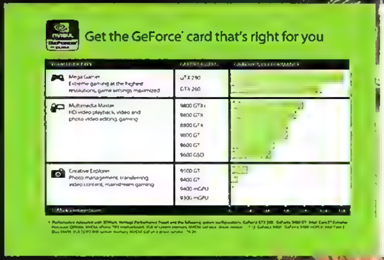
XFX 9300 Motherboard

E8400	333x9; DDR2-667 5-5-5-15
PiFast	32.97s
wPrime 32M – single thread	48.233s
wPrime 32M – multi-thread	24.501s (1.97x efficiency)
CineBench R10 64-bit – single thread	3689
CineBench R10 64-bit – multi-thread	6974 (1.89x efficiency)
Everest Read	5399MB/s
Everest Write	7071MB/s
Everest Latency	100.7ns

Performance It works, but slowly.	50
Value	NA
Features It's got them... but why?	80
Build Hot, can't overclock.	40
Overall Do. Not. Want.	45%

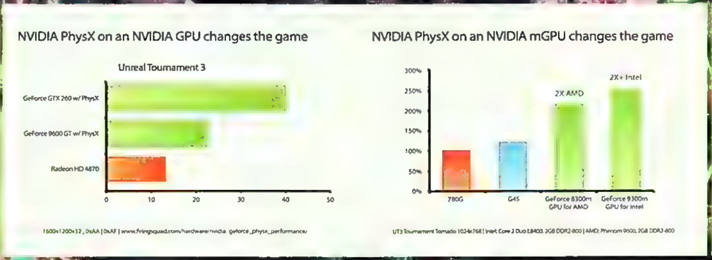
High definition, cinema-quality with no compromises

Beyond the field of game play, 7X fast in video [illegible]scoding & 100% offload H.264 playback loading from CPU.



Get the GeForce card that's right for you

Mega Gamer Extreme gaming at the highest resolutions, game settings maximized	GTX 280 GTX 260	
Multimedia Master HD video playback, video and photo video editing, gaming	9800 GTX+ 9800 GTX 8800 GTX 9800 GT 9600 GT 9600 GSO	
Creative Explorer Photo management, transferring video content, mainstream gaming	9500 GT 9400 GT 9400 mGPU 9300 mGPU	



NVIDIA PhysX on an NVIDIA GPU changes the game

1600x1200x32, 0xAA | 0xAF | www.firingsquad.com/hardware/nvidia_geforce_physx_performance/

NVIDIA PhysX on an NVIDIA mGPU changes the game

UT3 Tournament Tornado 1024x768 | Intel Core 2 Duo E8400, 2GB DDR2-800 | AMD: Phenom 9600, 2GB DDR2-800

SPEAK VISUAL
with Graphics Plus

Get NVIDIA GeForce with CUDA.
It's not just graphics. It's Graphics Plus.

N280GTX-T2D1G-OC

- Powered by NVIDIA® GeForce® GTX 280
- 240 enhanced processing cores
- SLI -Ready for 3-way NVIDIA SLI® technology
- NVIDIA PhysX technology support
- NVIDIA CUDA! technology support

N260GTX-T2D896-OC

- Powered by NVIDIA® GeForce® GTX 260
- 192 enhanced processing cores
- SLI™-Ready for 3-way NVIDIA SLI® technology
- NVIDIA PhysX technology support
- NVIDIA CUDA! technology support

N9800GTX PLUS

- Powered by NVIDIA® GeForce® N9800 GTX
- SLI™-Ready for 3-way NVIDIA SLI® technology
- NVIDIA PhysX technology support
- NVIDIA CUDA! technology support

www.msicomputer.com.au

Gigabyte 4870 1GB

Doesn't quite need 1.21 Gigawatts of electricity.

Price $477 **Supplier** GIGABYTE
Website www.giga-byte.com

Specifications 750MHz core; 900MHz memory (1800 effective); RV770 core; 800 shader units; 1GB GDDR5; 256-bit memory interface; dual slot PCB with active cooling; dual 6-pin PCIe power connector

Apart from a title inspired by Doc Brown, we've actually got a card to look at here! Specifically a graphics card, and this is one that we think you'll be interested in – even if it can't take you through time.

Based on the RV770 core that we've come to know and love (not to mention promising our firstborns to, as dowry), this core has 800 shader units that run at a stock speed of 750MHz. The memory chips are from Qimonda, and run at a speed of 900MHz on a 256-bit memory bus. GIGABYTE doubled the amount of memory here, giving an entire gigabyte of superfast GDDR5 memory – affording you plenty of space for large textures without running out of space or bandwidth.

These solid tech specs also translate into respectable physical ones with DVI, HDMI and DisplayPort all included. Twin Crossfire nipples are at the top of the card, giving you the capacity to run this card in tandem with one or two more of its brethren. Built around the traditional azurey-greeeney-blue GIGABYTE PCB colour, this is a rather neatly arranged card and is quite minimalist. Power is supplied from the PCIe 2.0 slot, as well as the dual 6-pin power sockets. Regulation for this power (all the filtering components that ensure power is directed where it's needed at the right voltage) is cooled by a large black heatsink, while the actual core of the card is taken care of by the Zalman VF830. This is a dual-heatpiped, aluminium-finned, 80mm-fanned cooler, which effectively draws the heat away and dissipates it inside the case. Unfortunately this means that there is another source of heat in there, so make sure you've got good ventilation to get that hot air out as effectively as possible – there's nothing worse than heat related instabilities with an overclocked rig!

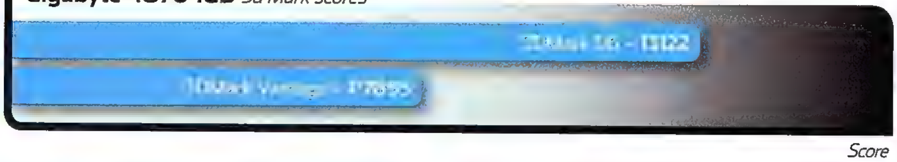
The Zalman managed to keep idle temps at 41 degrees and load temps at only 54 degrees, with a constant noise level of 64dBA. Fan control isn't possible through software here, as this uses a two-pin fan connector – RPM monitoring will also not function. This headroom for the core allowed us to bump it up easily to 790MHz without even breaking a sweat, though the memory chips don't like being pushed too far – they become swelteringly hot without significant airflow when overclocked. If our calculations are correct, when those babies hit 88 degrees you're going to see some serious instabilities (okay, we'll keep those BTTF allusions to a minimum). You can try adding some RAMsinks here, but keep in mind that you'll most likely break your warranty.

Gaming performance is exactly what we've come to expect from a 4870 at stock speeds. The extra memory didn't do anything extra for us in either the games or the benchmarks, but it'll become really useful for those with large resolutions, or those AntiAliasing lovers out there.

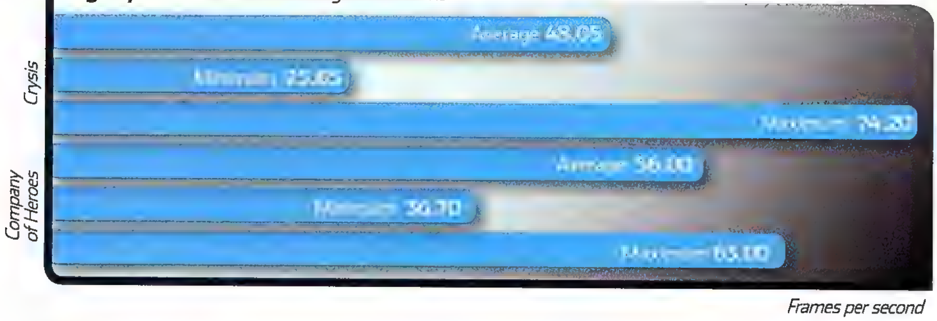
Sadly, the added memory doesn't really add enough of an appeal to really justify spending the extra cash on it right now. Since the downturn of the economy tech has taken a very large amount of blows under the belt, pummeling the metaphorical organs down there and causing prices to skyrocket. Something that would have cost you $325 only five months ago now costs much more. The only thing we can suggest is doing your research *before* you buy, and check out our opinions at **www.atomicmpc.com.au**

This is a good card, but unless you need big textures, you'd be better off with a cheaper 4870. **JR**

Gigabyte 4870 1GB *3d Mark scores*



Gigabyte 4870 1GB *Gaming benchmarks*



Performance It's the same RV770 lovin'. Tasty. **90**

Bundle Basic cables only, no game at all. **75**

Value Too much for not quite enough. **70**

Build Cool core, but toasty memory chips. **86**

Overall It's no DeLorean, but it has a charm all of its own. **78%**

GIGABYTE™

The Next Leap in Evolution

Delivering Dramatically Lower System Temp and Enhanced Stability for Overclocking

Unique Technology from GIGABYTE

Ultra Durable 3

- 2 oz Copper PCB
- 50,000 hrs. Japanese Solid Capacitor
- Lower RDS(on) MOSFET
- Ferrite Core Choke

Ultra Cool	Ultra Performance	Ultra Durable	Ultra Power Efficient

DYNAMIC ENERGY SAVER
GIGABYTE

6 DYNAMIC GEAR POWER PHASE SWITCHING
World's Leading Energy Saving Technology

QPI 6.4 GT/s
PRECISION OV
DUALBIOS™

Supports intel Core i7
Supports intel Core i7
intel X58 EXPRESS CHIPSET

EX58-EXTREME

EX58-UD5

EX58-UD4P

* Liquid cooling system sold separately

For more information, please call our distributors:

Australia

NSW	SYNNEX	02-8756-8899
	RECTRON	02-9352-0112
	ALTECH	02-8831-9999
QLD	SYNNEX	07-3900-6288
	ALTECH	07-3017-2000
SA	LEADER	08-8112-6000
WA	SYNNEX	08-9205-5788
	ALTECH	08-9242-8822
VIC	SYNNEX	03-8540-8851
	RECTRON	03-8545-2833
	ALTECH	03-9558-5090
NT	LEADER	08-8112-6000

New Zealand

Black Diamond Technology LTD	+64-4-560-9100
Dove Electronics Ltd	+64-3-338-4722
PB Technologies LTD	+64-9-526-9200

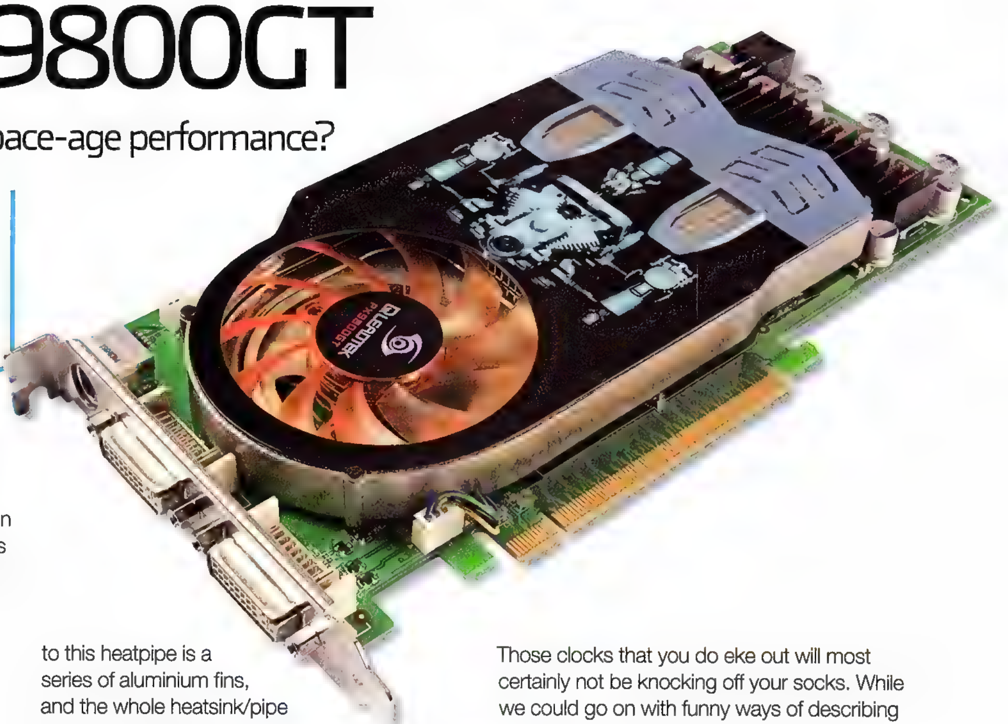
AUSTRALIAN PC AUTHORITY AWARDS 2008

www.gigabyte.com.au

These speed settings are not guaranteed by GIGABYTE. The specifications and pictures are subject to change without notice. All trademarks and logos are the properties of their respective holders. Any overclocking is at user's risk. GIGABYTE Technology shall not be responsible for any damage or instability to your processor, motherboard, or any other components.

Leadtek 9800GT

Do starshippy looks equal space-age performance?



Price $189 **Supplier** Leadtek
Website www.leadtek.com

Specifications 600MHz core; 900MHz memory (1800MHz effective); 1500MHz shader; G92b core; 112 stream processors; 512MB GDDR3; 256-bit memory interface; single slot PCB with active cooling; 6-pin PCIe power connector.

Leadtek, funnily enough, doesn't actually use any lead in its graphics cards – but the company does make each and every single one with plenty of loving care. This card is no exception, and is definitely an interesting addition to a very crowded market. But what trick makes this card tick? What clocks dost this card rock? And is the different cooler worth the moolah? Read on!

Specs for this card are quite respectable, featuring the 55nm version of the G92 core that's seen extensive (and exhaustive) use in many other products. 112 shaders, 512MB of GDDR3 memory on a 256-bit memory bus and a multitude of solid capacitors are all here, slotted into the right places (think square peg in a round hole, but make the round hole square first). This is all pretty standard fare, and certainly isn't amazingly different.

Something that is different however is the cooler. Gone is the single-slot stock cooler (although a silkscreened white outline of where that cooler would be is still present), as it has been replaced by another cooler – a cooler one! Sporting a large 92mm fan at one end, this enables the card to suck in a lot of air, and do so at a constant 53.7dBA. The core has a single heatpipe over it that runs towards the top lip of the card, before curling downwards around the circumference of the fan, dissipating the heat through the surrounding aluminium. Just next to this heatpipe is a series of aluminium fins, and the whole heatsink/pipe array is covered with a plastic shroud that guides the airflow through the fins, and past a separate black heatsink on the power regulation.

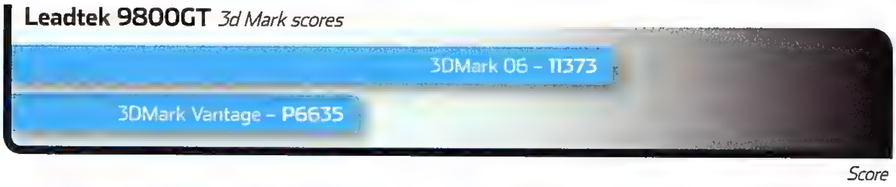
This plastic shroud has a somewhat unidentifiable mechanical construct pictured on it, somewhat resembling a mix between a starship and IG-88 from *Star Wars*! Had Leadtek used a black PCB instead of old-school murky green, this would have looked particularly exciting.

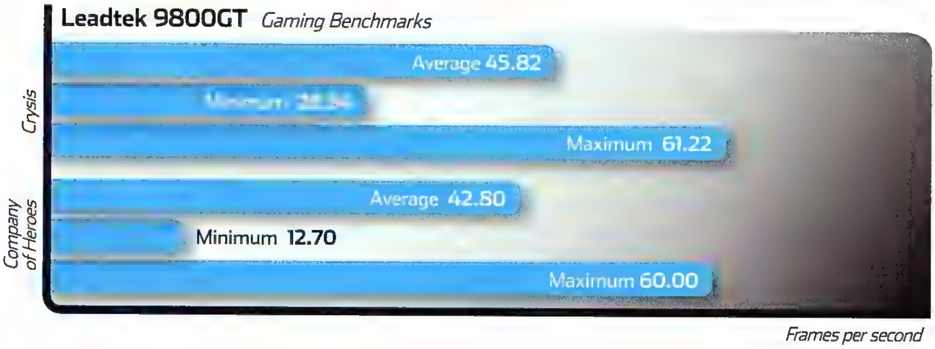
Performance is pretty good for the card's price, and certainly well within what we expect to see after what last issue's roundup showed (Issue 96 – there might still be time to grab a copy!). Since temperatures were managed down to 52 degrees at idle and 68 at load, there's a little wiggle room for some overclocking; just don't expect a miraculous increase in clocks. Those clocks that you do eke out will most certainly not be knocking off your socks. While we could go on with funny ways of describing the overclocking ability of this card, we really must press on.

Twin DVI ports and an analogue video out port are standard fare on the PCI bracket, as is the SLI nipple tab at the the top-left of the card. Power is provided via a 6-pin connector, and the fan is connected with a 4-pin PWM connector – you'll be able to control the fanspeed through software quite easily.

Bundled with this card is a decent array of all the cables and adaptors that you could want, and it even includes a game – Overlord. It's a pretty good inclusion, certainly enough to keep you entertained for a goodly amount of time.

So with acceptable performance, a bundled game, and a funky-looking cooler, this card will be very good for a LAN system, or even a cheaper gaming rig. Or even better, grab two of them in SLI and watch those pixels really fly! **JR**





Performance What you'd expect from this core. 85

Bundle A game fuels this card well. 89

Value Everything you'd need. 93

Build Some rough edges, but decent. 80

Overall Good value and performance, but this won't get you to space.

86%

Leadtek 9800GTX+

Almost completely not the same as what we've seen before.

Price $299 **Supplier** Leadtek
Website www.leadtek.com
Specifications 740MHz core; 1100MHz (2200MHz effective) memory; 1836MHz shader; G92b core; 128 stream processors; 512MB GDDR3; 256-bit memory interface; dual-slot active cooler; two six-pin power connectors

Okay, so maybe it is the same as what we've seen before, but that doesn't necessarily preclude it from being something worthy of a gander, gawk or glance. And perhaps most important of all, it does its stuff with a certain style and visual flair that you just don't see often nowadays.

Now you probably can't see the back of the card in the photo (try turning the page and shining a bright light through), but if you could you would see a brown chocolate coloured PCB that, while it doesn't quite taste like chocolate, serves a very important function in providing a base for all the other components of the card to be installed. Flipping the card over, the PCB is almost entirely covered up by that hauntingly black cooler. While this might look impressive, most of it is actually just empty space that serves to channel the airflow through the heatsink kept inside.

Naturally, you wouldn't be able to find out what the heatsink looks like underneath that shroud without removing the entire cooler – so we did. A total of nineteen screws later, and a further five for the shroud, we finally had the heatsink array taken off the card, and ready for our descriptural (stop making up words! *–ed*) rundown. Starting at the fan, we've got a Delta-built squirrel-cage model running on 12 volts at 0.44 amps – this is one beefy fan! The area around the fan in all directions is free of obstruction for roughly four centimetres, giving plenty of space to both draw in cool air and then finally move it through the shroud.

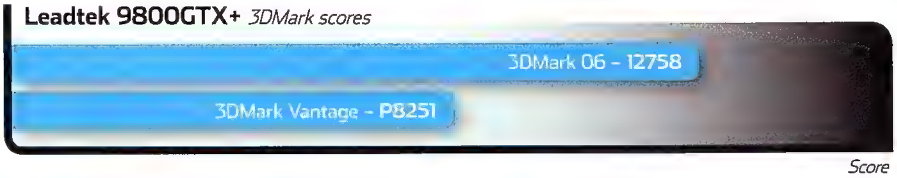
A large copper base with no less than three heatpipes is next, taking the heat generated and spreading it over a large area of aluminium fans. The memory chips are all cooled by raised blocks of aluminium with a thermal pad to fill any gaps. Power regulation is also included in the heatsinky treatment, keeping everything cool that needs to be. Quickly screwing the heatsink back on, and without any parts left over either (a surprisingly rare occurrence), let's move on to the rest of the card.

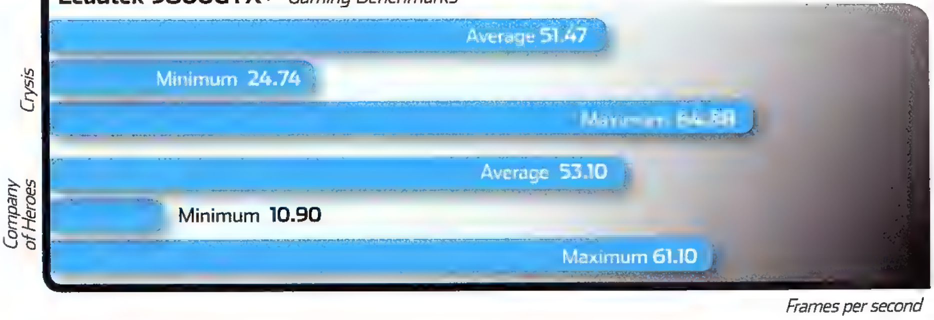
Sandwiched between the cooler and the PCB is the G92b core, a 55nm revision of the same bloody core we've seen in half a million cards before. Well, that might be an exaggeration of how many we've seen, but there's certainly been a lot of cards based around the G92 core simply because of the performance to cost ratio – it's very tempting. A decidedly standard amount of memory is provided, and we're hoping that more games developers will start to take advantage of the extra wiggle room that half a gigabyte of graphics memory affords. Not only is there a sizable chunk of memory here, but it's connected with a 256-bit memory bus, pumping liquid pixelly gold into the waiting metaphorical buckets of space. Attempts at poetic license aside, this means that the performance of this card will not only be unwaveringly predictable, but also quite solid.

This is backed up in both the 3DMark programs (with a strange correlation between the 06 and Vantage numbers), and performance is similarly good in both our gaming benchmarks. This card is also PhysX enabled, which will give you a chance for some wanton destruction in your favourite compatible game.

Speaking of games, Leadtek very nicely bundles a copy of *Neverwinter Nights 2* – we're really liking the extra effort that Leadtek goes to when including a game with its cards. Also included are the usual cabling and adaptors.

Overall this card is quite good – but when you consider stretching just a little bit more to a 4870, it pales ever so slightly. **JR**


Leadtek 9800GTX+ *3DMark scores*


Leadtek 9800GTX+ *Gaming Benchmarks*

Performance Solid performance.	86
Bundle Very good game, usual cables.	91
Value Good, but not amazing.	75
Build Does the job well enough.	80

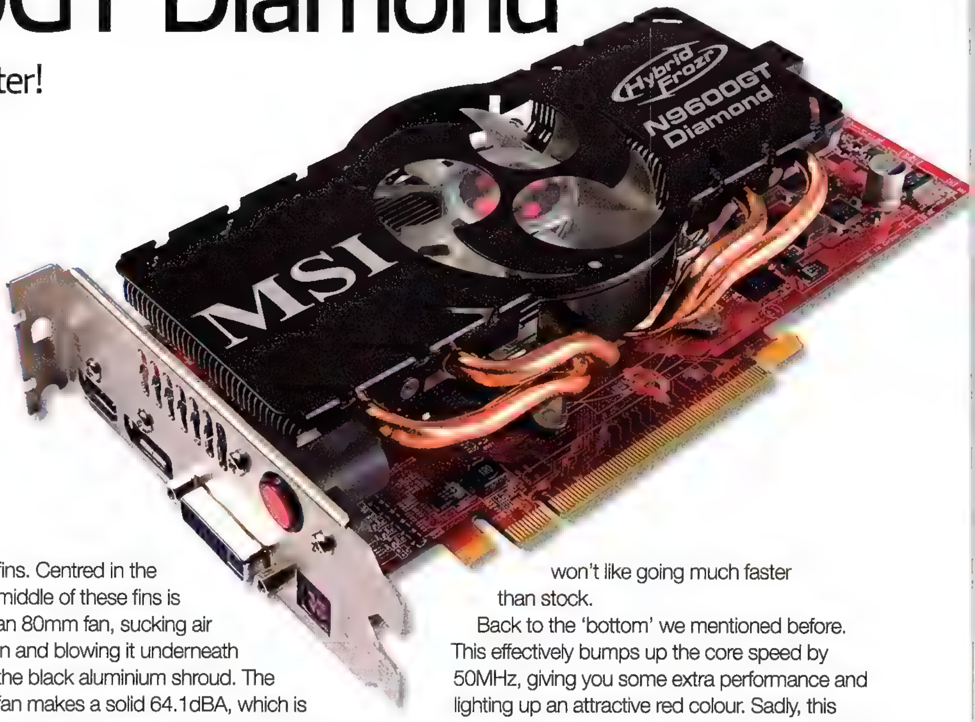
Overall
A solid card with a great bundle, if a little dated.

80%

MSI 9600GT Diamond

Touch my bottom and I'll go faster!

Price $247 **Supplier** MSI
Website www.msi.com.au
Specifications 700MHz core; 900MHz memory (1800MHz effective); 1625MHz shader; g94 core; 64 stream processors; 512MB GDDR3; 256-bit memory interface; dual slot PCB with active cooling; 6-pin PCIe power connector.



Yes, we're serious – but let us explain before assuming this review is all about posteriors. This MSI card comes shipped in a large black and gold box, proudly boasting an array of features, including the usual DisplayPort, HDMI, DVI connectivity and the rest, but it also includes one other claim – an Easy OC Bottom. What this is supposed to be describing is a small red button on the PCI bracket, whose purpose is to enable dynamic overclocking of the core, but in actual fact it's a very inconvenient typo. Not many bottoms will light up when you press them, and if yours does, get yourself to a doctor – pronto!

This card is based around the G94 core, a 65nm version of the G92, but comes with only 64 stream processors. There's 512MB of GDDR3 memory on a 256-bit memory bus here to make sure that the core has plenty of Data-Food to digest and pass (this is totally not a subtle reference to the card as an organism….with a bottom) to the screen, giving you some very tasty pixels.

Cooling for this card is another area where inconsistencies in naming arise. Plastered all over the box is 'Hybrid Freezer', but the card plainly states 'Hybrid Frozr'. When we asked MSI about both of these entertaining errors, they were rather embarrassed, and put it down to a translation error. All mistakes in nomenclature aside this cooler does the job well, with four thick heatpipes originating at the core and mating with a thick copper base, flowing around to the aluminium fins. Centred in the middle of these fins is an 80mm fan, sucking air in and blowing it underneath the black aluminium shroud. The fan makes a solid 64.1dBA, which is unnecessarily loud considering that idle temps are 36, and load hits only 41. Fortunately this is a 4-pin PWM fan, so you can manually control the speed via software.

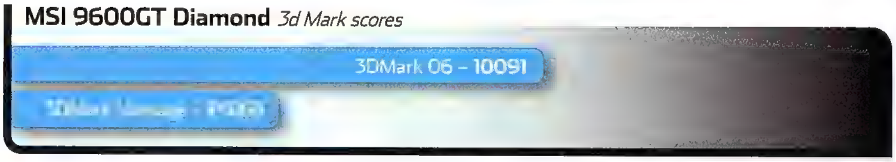
The PCB is a bright red colour, and comes with solid caps as standard (with an option to upgrade to luxury leather-capped caps as well). A six-pin power connector fills it with the appropriate amount of electrons, and the SLI nipple tab at the top lets you use two of them in tandem to give you even more performance. Strangely there are sixteen memory chips present, eight on each side of the PCB, but these all add up to only 512MB. Our best guess is that these lesser chips were cheaper to use, but you might find that the memory maximum speed is limited – the more chips present, the more likely that one of them won't like going much faster than stock.

Back to the 'bottom' we mentioned before. This effectively bumps up the core speed by 50MHz, giving you some extra performance and lighting up an attractive red colour. Sadly, this doesn't really amount to all that much in real world terms, gaining us only about 50 3DMark06 points, but it's still kind of fun for those less confident with their overclocking skills.

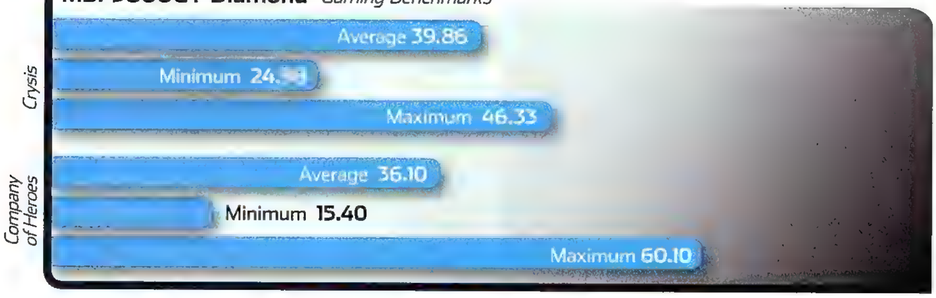
The bundle for this card is relatively light, and doesn't include a game. All the cables are there however, as well as a program coded by MSI to give you overclocking and fan speed control in Windows. While we haven't used it, it looks to have all the usual features in a relatively easy package.

The one major downfall of this card is the price, coming in at just over a hundred dollars more than a stock 9600GT, while making much more noise. Until this card comes down, we suggest you mosey on over to 9800GT territory and call it done. **JR**

MSI 9600GT Diamond *3d Mark scores*



MSI 9600GT Diamond *Gaming Benchmarks*



Performance Good, but not groundbreaking.	82
Bundle Bare necessities.	70
Value Too much over a normal card.	50
Build Good cooling, but loud.	86

Overall
Attractive from far away, but up close this bottom fails to impress.

71%

Crucial Ballistix Tracer PC3-10600

Introduce a memory-controlled lightshow into your rig!

Price $TBC **Supplier** Crucial
Website http://www.crucial.com/
Specifications 2x 1GB kit; PC3-10600; DDR3-1333; 6-6-6-20; 1.8v; 240-pin DIMM; Non-ECC Unbuffered DDR3

Crucial is a very well known manufacturer of memory in the enthusiast scene, and is renowned for pretty affordable, but still very overclockable, memory. Well this kit is definitely up to their standards – and even comes with a few surprises under its spreaders.

These are technically your standard DDR3 memory sticks, with 240 pins, keyed specifically to stop you from using them in a DDR2 slot, and the usual arrangement of memory chips covered with a thermal pad attached to a heatspreader. Here's where it starts to get cool – the heatspreaders are black, and framed with roughly brushed aluminium.

Not to be outdone by a simple colour-coordination, these sticks have two rows of eight LEDs along the top edge – one red and one green – that flash in time with the memory accesses. We had a ball watching them being accessed, especially during the benchmarks where the lights begin dancing along the modules, creating a very exciting visual element for any system with a window. Coupled with the lights along the top, there are even LEDs near the pins of the sticks that light up blue and give a very cool under-body glow (similar to street cars no less!).

Overclocking performance was quite strong, and these sticks can perform very well if you're prepared to give them a little tweaking. Keep in mind that you can't use them with Nehalem, as the 1.8V needed would fry the integrated memory controller pretty quickly unless you've got a lot of LN2. For now you're going to have to order these babies from Crucial directly at its website, or source them elsewhere – but they're definitely worth it for sheer awesomeness value. **JR**

Crucial Ballistix Tracer PC3-10600

	1333MHz; 6-6-6-20 (2T); 1.8V – Stock	1600MHz; 8-8-8-28 (2T); 2.1V
Hexus PiFast	30.58s	28.95s
wPrime 32M 8x	24.429s	22.984s
Everest Read	7698 MB/s	8133 MB/s
Everest Write	7049 MB/s	8501 MB/s
Everest Latency	65.7 ns	67.7ns

Overall
Great 'clocking memory, complete with photons!
94%

Patriot PVS34G2000LLKN Memory Kit

It isn't easy being green.

Price $555 **Supplier** Patriot
Website http://www.patriotmem.com/
Specifications 2x 2GB kit; PC3-16000; DDR3-2000; 9-9-9-24; 2.0v; 240-pin DIMM; Non-ECC Unbuffered DDR3

We've not seen anything that is quite as… green as these are. Because they include EPP 2.0 support (a method of telling NVIDIA-based 790i chipsets what settings to run memory at), this was enough of an excuse to coat these sticks in a very unfortunate lurid snot-green colour.

Being shaped like a comb doesn't help too much either, conjuring up images of just exactly how a comb would become that colour. The good news about the heatspreader is that it does offer a large surface area, and can be used as a makeshift rake in emergencies.

Performance is good, though you'll need slightly higher voltages to get the sticks stable. The stock speeds of the kit refused to even boot, something we blame on making them too ambitiously high for normal boards – our P45 mobo couldn't handle running these at the rated 2000MHz at CL9 timings. While we didn't have a 790i based motherboard in the Labs (X58 has pretty much already replaced it!), we don't expect that performance will be realistically any better on that chipset, either. **JR**

Patriot PVS34G2000LLKN Memory Kit

	1333MHz; 6-6-6-20 (2T); 1.9V	1600MHz; 8-8-8-24 (2T); 2.0V
Hexus PiFast	28.74s	34.60s
wPrime 32M 8x	23.65s	27.331s
Everest Read	8718 MB/s	7914 MB/s
Everest Write	8502 MB/s	7096 MB/s
Everest Latency	60.6 ns	65.7ns

Overall
Tricky sticks, high price.
72%

Xigmatek HDT-SD964

Pint-sized cooler with some good features.

Price $39 **Supplier** Multimedia Technology
Website www.mmt.com.au
Specifications Tower cooler; four 6mm heatpipes; one 9cm fan; aluminium fins

HDT, or Heatpipe Direct Touch, is one of the main features of this cooler, first seen in the Red Scorpion reviewed back in Issue 93. The SD964 also has this, but manages to cram it into a smaller size, with an even more attractive price – but is it worth looking at?

Looking at the base of this cooler, you'll notice that there isn't a block of copper with heatpipes soldered into it – the base IS the heatpipes. They've have been flattened down to touch the heatspreader of the CPU directly. The reasoning behind this is that if you can remove an extra step in the heat transfer (in this case the base), you'll be able to get the heat out of there much faster. There are a few gaps, but for the most part the base is incredibly flat, and the gaps shouldn't affect performance.

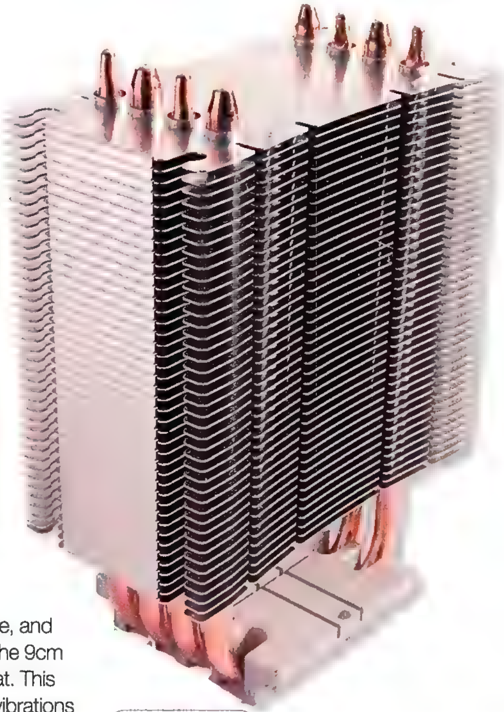
Mounted onto these heatpipes is an aluminium block that helps them retain their shape and structure, as well as providing a mounting point for either the AM2 or LGA775 stock clips – and yes, this heatsink uses the Intel pushpins. This means that you won't have to remove your mobo before installing the heatsink, which is quite handy.

The heatpipes are bent into a U shape, and run through 42 aluminium fins to allow the 9cm fan the best chance to dissipate the heat. This fan is mounted via rubber 'nipples', so vibrations aren't a problem.

Performance with a Quad is okay at stock, but don't expect to be overclocking a Quad with one. For smaller systems or Dual cores this is an excellent choice, however, especially if you're after a low-profile cooler. Just take a look at the low price – you're definitely getting an improvement over the stock cooler if you stick to Dual CPUs, without a huge investment. **JR**

Xigmatek HDT-SD964

	Load	Idle
3GHz, 1.325V	66	37
3.66GHz, 1.45V	78 - Crashed	50



Overall
Great for lower heat systems, but not for high-output.
86%

ASUS Axe Square

The most efficient shape for a weapon?

Price RRP$149 **Supplier** ASUS
Website www.asus.com.au
Specifications Orangey cooler; five 6mm heatpipes; one 12cm Orange LED fan; aluminium fins

We're not entirely sure what the deal is with the recent 'Square' branding that ASUS is using for its newer heatsinks, but there are a few things we're sure about – including the packaging of this cooler. If you think you knew what opulence was, think again.

Packaged in a very large box with faux crocodile skin coating, you open it to discover the heatsink nestled inside extremely high quality material – the damn thing is the nerdy equivalent of getting a ring! Not only that, but the accessories are packed inside their own magnet-clasped box, encased in form-fitted foam. Since this is a limited edition cooler, there's even a little aluminium plate here with adhesive backing to show off the heatsink!

Sadly though, it's not really worth showing off. The base of the heatsink is nickel-plated copper, and is decidedly diminutive, barely covering most of the IHS. Five heatpipes begin here, three to one side and two to the other, before arching upwards into 58 aluminium fins. These fins are encased in a tacky plastic shroud that serves next to no purpose other than making the heatsink look cheap, and providing a mount for the fan. The fan is an ASUS-branded affair, with surprisingly orange LEDs used to give a rather unique look. It idles at an insanely quiet 45.5dBA, but load brings it up to 56.5dBA – not exactly quiet when you check out the temps. While running, we placed our hands underneath the fins and could barely feel any airflow – this fan seriously needs reworking. Higher static pressure would be a great start, as more air really needs to be forced through the fins.

It's a poor example of a heatsink compared to the other rousing successes that ASUS has had recently, and all that money could be better put towards other areas of your rig – unless you're a packaging-ophile that is! **JR**

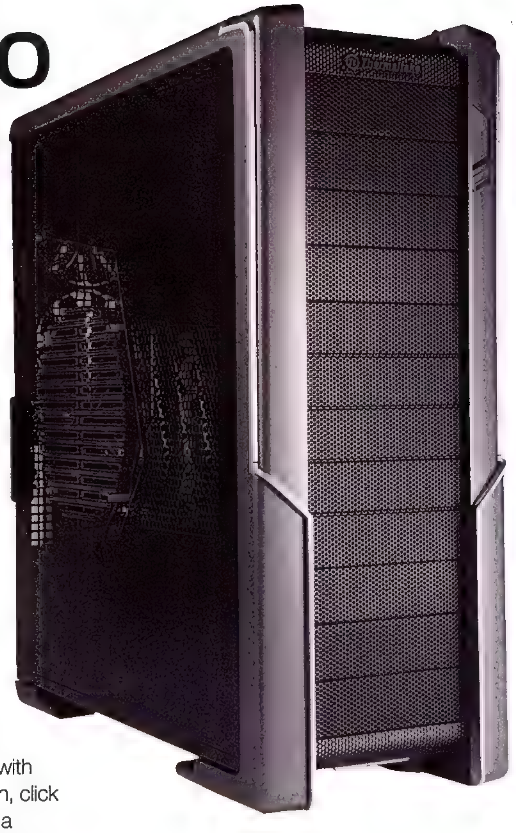
ASUS Axe Square

	Load	Idle
3GHz, 1.325V	72	39
3.66GHz, 1.45V	79 - Crashed	54

Overall
Does the job terribly, looks bad, but packaging is fit for a king.
58%

Thermaltake Spedo

If you think this is about a pair of swimmers, prepare to be proved wrong.



Price $289 **Supplier** Anyware
Website www.anyware.com.au

Specifications: 232 x 536 x 610mm (W x H x D); 1 x 140mm LED Fan (front); 1 x 230mm Fan (top); 2 x 120mm Fan (rear); 1 x 230mm Fan (side window); 7 x 5.25in drive bay (external); 6 x 3.5in drive bay (internal); ATX, M-ATX; SECC Steel with windowed panel.

Thermaltake has made some pretty solid enthusiast cases over the years (just check out the Armor series for a great example), and they're looking to continue that with the oddly named Spedo.

The front fascia is an impressive mix of black steel mesh and light gray plastic, with a very appropriate Thermaltake logo at the top. Power and reset buttons are at the top right, but they feel extremely flimsy, as if you could break them just by using them. You probably won't, but they're not amazing. Moving up to the top of the case there are two USB ports, audio/microphone jacks and an eSATA port.

Four raised vented 'lips' lie close to the front of the top, while the remainder of the top is a meshed area that has a small slope impressed onto it – essentially making a tray. Strangely there is another layer of wide mesh, then yet *another* layer underneath that before the 230mm exhaust fan – just how much material needs to be in the way here? Not only that, but all the layers of mesh are thick enough to let pretty much every single screw you'll use in the build fall through, potentially meaning that you can drop a screw without realising, turn your PC on, and release the magical blue smoke.

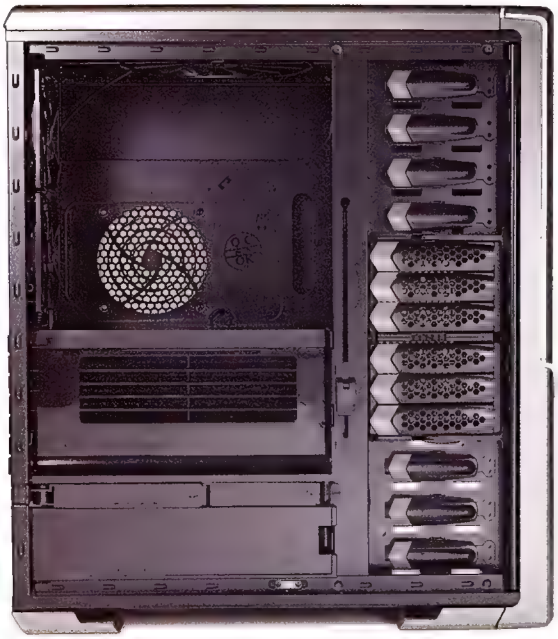
The back of the case is excellent, with dual 120mm fans, soft rubber grommets around twin holes for watercooling, and plenty of ventilation to let heat escape. The power supply is mounted at the very bottom – Thermaltake even include a 24 AND an 8/4 pin extension cable! The right side panel is well ventilated, but the left windowed one is even better – a 230mm fan is inset in this window, with mesh here as well. A bloody great idea for this fan is that the cable snakes down the panel, connecting with two pins. These pins mate with two contacts on the case, powering the fan and removing the need to worry about pulling the cable! This is an exceptional idea.

Moving inside the case, you can see that the 5.25in bays are held in place with tool-free brackets – simply slide the drive in, click them closed, and that's it! Hard drives are a similar story, just remove the plastic tray, sit your HDD in (on little rubber washers to absorb some vibration) and slide it back in. There are three 3.5in bays per bank, and there are two banks that you can move up or down the case as you see fit. From the inside, you'll notice that the front meshed panel also has foam behind it – great for minimising dust inside the case.

Yet another great aspect of this case is the motherboard tray, where there's a mount for a 120mm fan to blow directly at the CPU socket, making sure that both sides of the mobo are cool. There are two cutouts that allow cabling of SATA/IDE and power cables, and Thermaltake has even included black screws to secure the mobo with – now that's attention to detail! Cable management is excellent behind the tray too.

The plastic guides at the bottom of the case can be removed to install hardware, but the tool-less PCI securing system is very flimsy – stick with screws. There's also a fan holder mounted on a rail that can be positioned anywhere, and Thermaltake even include a fan!

This is a really excellent case, and if you like the looks or want the features, there really is nothing more affordable. **JR**



Build	High quality plastic and steel throughout.	90
Value	For a case this size, it's definitely worth it.	92
Cooling	We're not sure that you'd need more flow!	95
Features	Exceptional ideas, and forethought.	98
Overall	The perfect case for any Atomican.	94%

Thermaltake Xpressar

The gargantuan case with a fridge inside!

Price $TBA **Supplier** Anyware
Website www.anyware.com.au

Specifications: 605mm x 660mm x 250mm (W x H x D); 1 x 140mm LED Fan (front); 1 x 140mm Fan (top); 1 x 120mm LED Fan (rear); 7 x 5.25in drive bay (external); 5 x 3.5in drive bay (internal); ATX, mATX, eATX; SECC Steel with meshed panel; inbuilt cooling system.

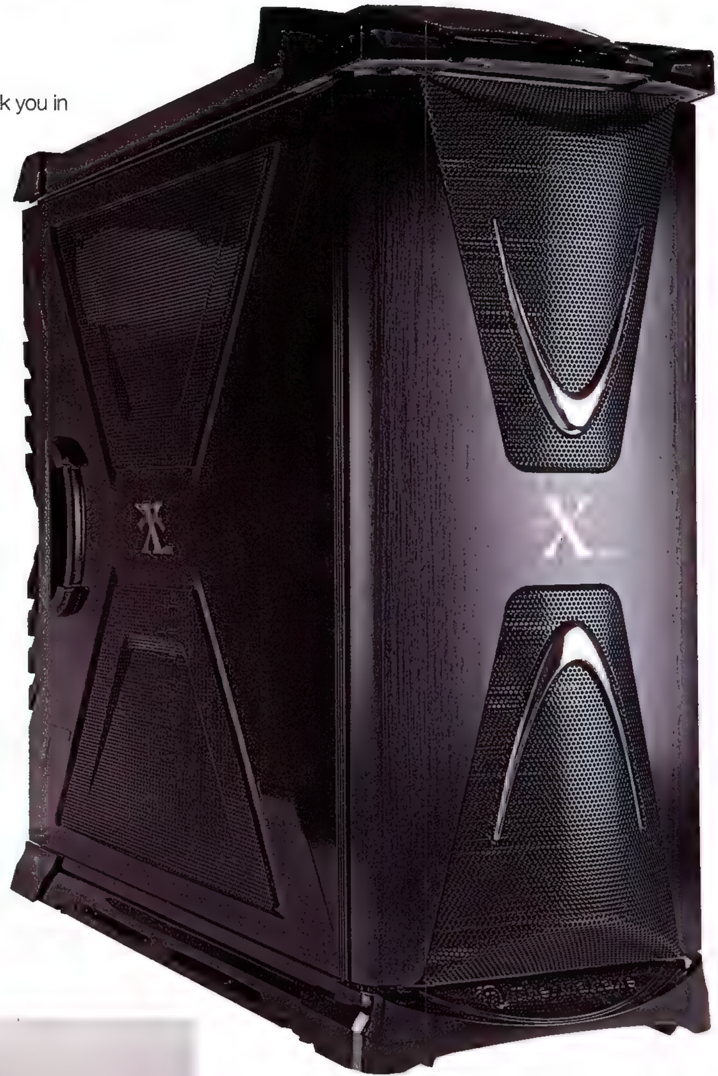
If you've picked this mag up, it's probably because you're very interested in extreme computing tech. Well, things don't get more extreme than this intimidatingly large, oppressively heavy and surprisingly sturdy case – or at least we'd like to think so. We've spent some quality time with the Xpressar, but was that time rewarded with some loving, in the form of an awesome experience?

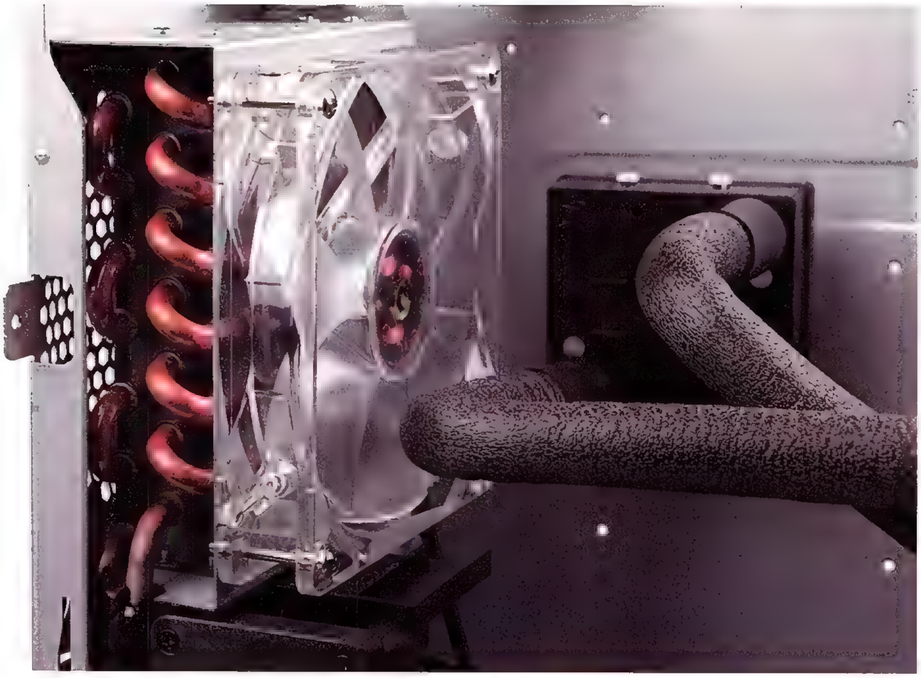
The Case

We've already mentioned how big this case is, but check out the dimensions in the specs box for a second. That's a recklessly huge case, not to mention all the metal involved, but let's chuck the brakes on and describe the case itself. Starting at the front, there's a brushed aluminium door held on with plastic hinges. These hinges aren't too strong, so make sure you don't place too much force on the door – it might snap off if you're not careful! While we're on the topic of weak elements, the magnet that holds this door closed is rather meek, so keep an eye out for the door swinging out to whack you in the groinal region if you're not paying close enough attention while moving the Xpressar.

Behind this door are seven 5.25in bays; the remaining space is meshed to allow a lot of air movement. Down the bottom of the mesh is a 140mm blue LED fan that gives off an interesting glowing effect through the door while closed. Back to the door for a second, because we're not really all that impressed with the chromed U-shape pieces stuck on there, as they don't really fit in with any kind of scheme, nor do they improve the looks any. The logo here is understandable, but surely this can preclude any elsewhere on the case?

Raising our viewpoint to the top of the case gives us a better look at the front lip, where there is a glossy black 'hood' that rises to reveal two eSATA ports, four USB, Firewire and audio/mic ports, as well as the power and reset buttons. The power button is shaped like an X, and actually looks pretty cool, though the reset button is a simple small silver button that isn't really that noteworthy in comparison. LEDs are also here to show HDD access and power.





Placed on the top of the case are two triangular wedge-shaped areas of mesh, with another case logo between them. The rearmost meshed area serves as an exhaust vent for the large 140mm fan. At the backend of the case is an extended area of plastic resembling a ledge, similar to what you'd see on an older sandstone building – except this one has a sticker on it telling you that it is NOT a handle. If it's not going to be a handle, dear Thermaltake, then why put it in the place that a handle would actually be useful?

At the rear of the case, just underneath this ledge, is where the PSU resides (by inserting it from the inside of the case, and screwing it in). The I/O shield and 120mm fan cutout is here, followed by *ten expansion slots!* We can kind of see why this would be handy, if you've got an excess of fan controllers that work back here, but it's not exactly something that many people would need, let alone use.

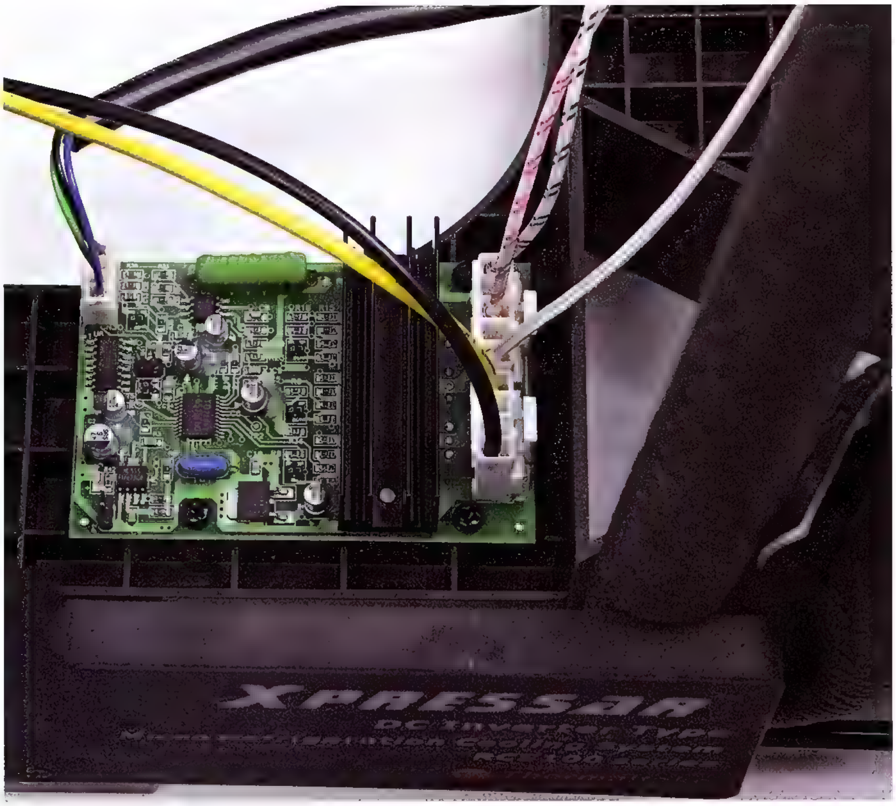
The left-hand sidepanel features a dual-hexagonal meshed area, just like the right-hand panel but without the handle. These panels are made of incredibly thick gauge steel, and are very sturdy. With all the obvious features of the case covered, let's move on to what's inside.

Now that's cool!

You're probably wondering why this case has so much attention given to it – well that's because it essentially has a refrigerator inside it. While it's not going to be too good at chilling your beer (though that's always a great use for it), it is supposed to be able to keep your CPU cooler than a heatsink.

The system is filled with a special thermoconductive material (or refrigerant) that is able to be a gas and a liquid. Codenamed R-134a, the cycle starts in vapour form just before the compressor, that large cylindrical object inside the case. The compressor, um, compresses this vapour to form a saturated vapour (also known as dense), which is at a high temperature. As it passes through the condenser, the dense vapour hits the cooler surface and loses much of the heat, allowing it to become a liquid.

This liquid flows through to the Expansion Valve, which rapidly expands the liquid, and spreads it over a larger volume. The huge drop in pressure also brings the temperature down significantly, and the chilled liquid passes over the CPU where it drops the CPU temperature, absorbing a lot of the heat and changing back into mostly heated vapour. This passes through the Evaporator, which (similar to a Radiator in a watercooling loop) dissipates much of the heat, and allows the cycle to begin again.



After all this effort, you'd assume that performance would be rather awesome indeed. Instead, while it raised our hopes – with an idle temp on our QX6850 at stock of only twelve degrees – it then dashed them rather fully when it crashed after overclocking. Stock settings managed to go from 12 idle to 51 load, but when overclocked this rocketed up to 32 idle and 81 load! The system crashed at this heat, and it really is a very poor effort considering the frustration of installing the fiddly mounting gear, not to mention plugging the cables inside such a crowded case.

Not only does it not cool better than even a normal heatsink, but it makes a huge amount of noise and vibration, only some of which is dampened by the solid steel case. Due to its huge weight both empty or with a system, disappointing cooling performance and loud noise, we can't really recommend this case to anyone – apart from those with more dollars than sense. **JR**

Build	Heavyweight, but incredibly solid. Watch your back with this one!	90
Value		NA
Cooling	Inconvenient installation, lukewarm performance.	40
Features	Pretty solid features in the case.	80
Overall	Get this if you're into dropping loads of cash for very little benefit.	50%

Lancool PC-K1

A stolid and workmanlike case with few surprises.

Price $US130 **Supplier** Lancool
Website www.lancoolpc.com
Specifications: 210 x 450 x 490mm(W x H x D); 8.2kg; 5x 5.25in drive bay (External); 5x 3.5in drive bay; 1x 140mm (front), 1x 120mm fan (rear); 2x USB2.0, 1x IEEE1394 1x HD+AC97; ATX and micro ATX; Aluminium and steel construction.

One of the sad truths of hardware reviewing is that – sometimes – you simply get snowed under by tech, and lose track of what's floating around in the review pile. While going through said pile recently, we came across this case from Lancool and wondered why the hell we hadn't gotten around to looking at it. Thankfully, it's a problem easily fixed.

Lancool is a subsidiary of Lian Li, and that pedigree shines through in the looks sported by the Metal Boned PC-K1. The brushed aluminium exterior and the plastic power and reset buttons are tres Lian Li, so this is a good budget answer to getting those looks without forking out for the more expensive real deal. We're particular fond of the satiny-smooth finish on the aluminium, and more than once we were caught lovingly stroking the side panels and sighing contentedly.

However, that lovey feeling disappears when you open up the case. There's nothing wrong with the PC-K1 per se, but it's all kind of... plain. The HDD fittings are of the usual Lian Li rubber grommet and thumb-screw variety, and the 'tool-less' ODD racks are barely worthy of the term. We do, however, applaud the use of plain old screws to secure expansion cards, and the ventilated slots will help airflow through the case.

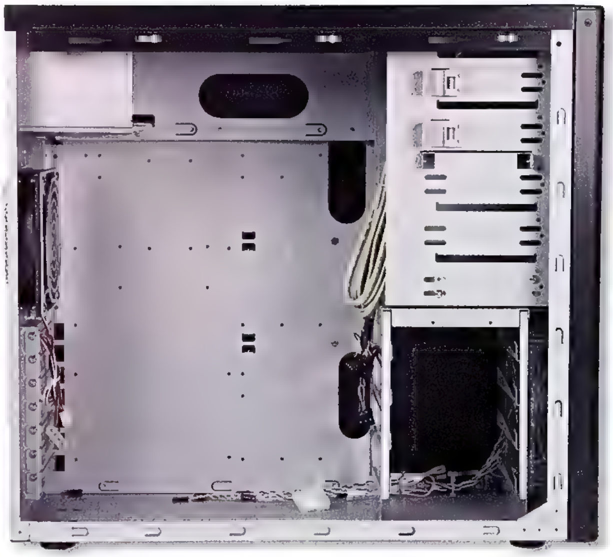
Which you'll need all the help you can get with, really, as the two stock fans are not the greatest pushers of air. You'll definitely want to add more fans to this case if you're an overclocker (and if you're not, why aren't you?!) or are using a particularly hot-running graphics card (we're looking at you, 4870X2).

One thing this case does excel at, however, is excellent cable management. There are cunningly placed holes (with nicely rolled edges) in the mobo plate and surrounds to pipe cables through; the mobo plate also pops out for easy install, and you'll find two metal clips behind it to keep cables snug and secure. It's all very solidly built, too, with nary a rattle to hear when you drop it from a few feet.

Not that we'd ever drop a PC case from such a height. We generally kick them instead – it's easier.

What really gets our goat, though, is the labelling on the case's box saying that it's "liquid cooling ready". Bollocks, we say, as simply adding two tabbed bits of metal on the rear that you have to punch out yourself does not in fact make it "liquid cooling ready". The fact that there aren't even any rubber grommets included in the bits box simply adds insult to injury; you'd need to either source them yourself or be very careful with setting up any external cooling loops.

Close, Lancool, but no cigar. **DH**



Build 81
Solid and well thought out.

Value 75
There are cheaper cases.

Cooling 69
Inadequate for most enthusiast needs.

Features 78
Some good, some bad.

Overall
A case that looks the biz, but can't quite deliver it.

72%

Coolermaster Sniper

A PC case that's close to a bullseye, but still slightly off target.

Price $TBC **Supplier** Cooler Master
Website www.coolermaster.com

Specifications: 10.6kg; 566 x 254 x 551mm (D x W x H); 1x 200mm fan (front), 1x 200mm fan (top), 1x 120mm fan (rear); 4x USB, 1x Firewaire, 1x eSATA, 1x Mic, 1x HD audio ports; 5x 5.25in bays; 5x 3.5in bays; SECC, ABS plastic and mesh; Micro-ATX & ATX.

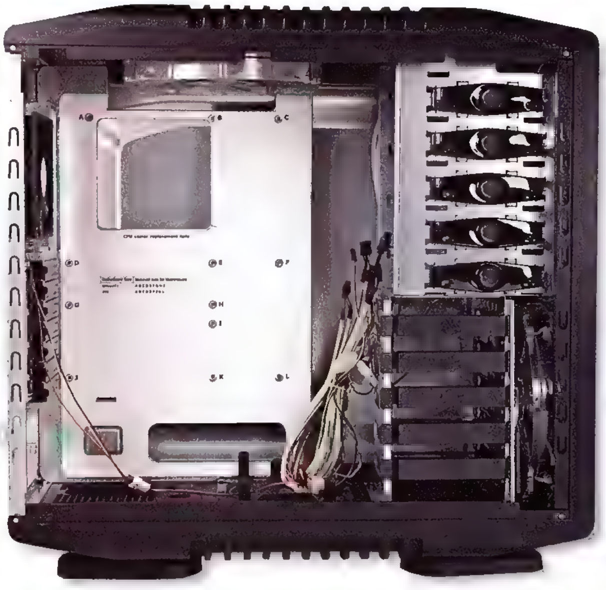
Ah, Cooler Master. So many of the innovations in the company's case design are top-notch, can't-live-without-'em ideas. It's worth noting that some of our favourite cases have been from Cooler Master. But it's equally worth noting that some of the most annoying and fiddly mechanisms known to humanity exist inside these chassis. So, while the Sniper case on review here takes many leaps in new directions, it still makes a lot of the same old mistakes.

Externally it's a wholly new look, seeming to combine the curves of Cooler Master's Cosmos series with some of the angular bluntness of the HAF high-airflow design. As always, the end result is a matter of personal taste. That said, if you also think the upper surface of the Sniper is kinda-sorta reminiscent of the out-rigger landing bays of the new Battlestar Galactica, your decision to love this case may have already been made for you.

The design also features some supposedly handy practical features, but this is also where the first of our issues with this case start to crop up. The upper curved surface houses two carry handles, which certainly make the Sniper easy enough to lug around. However, they also feel a little flimsy. Even worse, below the raised shroud they are found in is a wide mesh grill for the outflow of the one of the case fans. In our patented screw-drop tests, we found that standard internal case screws simply love to fall through this space into the case below. Not a problem when your PC isn't on, but it'll be a whirling maelstrom of metallic death once the fan is spinning. Not death for you, but death for your shiny expensive parts. Strike one.

Two thumb screws secure both side panels, and with these off the interior is nice and roomy, and pretty much par for the Cooler Master course. There's the same push-button 5.25in drive brackets and sliding 3.5in bays that we love, and the same expansion card mechanism that we have hated in the past, hate now, and will continue to hate long into the future. About the only thing that stands out as impressive and new is the extra internal room the inch-deep emboss on the side panels gives you. This is great for both overly large CPU heatsinks, improves airflow, and delivers a lot of cable space behind the mobo backplate. Speaking of airflow, the case's two blue-LED-lit 200mm fans take care of that elegantly, though the built-in speed control knob, while a great touch, could have been built a lot better. Frequent upgraders will certainly not have any issues with space in this roomy case.

The overall build quality of the Sniper is top notch, and touches like the anti-theft USB cable bracket and handles make this an awesome case for LANing. The large mesh inset in one side panel and the big fans will make the case airy, too, but we still think the HAF has the edge. The Sniper comes close, but is ultimately just shy of the mark. **DH**



Build Solid, though over-engineered in some areas.	79
Value	NA
Cooling Not an issue, with room for a lot more fans if needed.	86
Features Some really good, some bad.	77
Overall A striking look, but let down by some poor design choices.	79%

Gaming ON THE GO

David Hollingworth looks at a posse of on-the-road gaming powerhouses. Is this the year of the gaming laptop, or are they just too slow?

Once upon a time, when the world was young, gaming was purely the preserve of dedicated desktop machines sporting the latest gear, and backed up by the biggest, brightest displays money could buy. For many enthusiasts, the desktop is still king, but the humble laptop is fast catching up when it comes to performance and screen resolution.

There's a lot of reasons laptops have come so far. For one, Intel's multi-core CPUs and tick-tock release strategy have ensured a steady stream of high power chips trickling down to mobile makers. For another, NVIDIA's been pouring a lot of energy into getting its GPUs running as cool as it can in order to crack the laptop market. And, finally, LCD screens have come along leaps and bounds, now supplanting the behemoth CRTs of yore in even the most hardcore of desktop rigs.

Add to that advances like ultra-small 5.1 speaker setups, a new breed of bold laptop designs, and the growing popularity of gaming as both a past-time and a lucrative career, and you can see that a machine you can take with you and play on anywhere is suddenly not only possible... but attractive.

For this round up we've got five of the best of breed in the market today, including some black sheep you may not even have heard of. We've even taken the huge leap to invite Apple to the party – Steve Jobs' people claim the new Macbook Pro is ideal for gaming, so we're going to give it a chance to sink or swim with the big boys.

So, if you're looking for an alternative to a bulky desktop, want the ultimate in mobile speed and style, or are a pro-gamer wanting the finest tool to match their razor-honed skills, read on!

How We Tested

Testing laptops is – perhaps not unsurprisingly – not unlike testing any other PC. Essentially, it's the same parts, just in a slightly different form factor. If you're familiar with our normal PC testing procedures, or remember the Gaming PC round up from Issue 91, you're pretty much on top of things, but for newcomers in the audience, here's how we roll:

Crysis, our standard settings
3DMark06, default settings
3DMark Vantage, default settings

For more info on these games, our standard settings, and why they're our top pics, check out the more in depth How we Test explanation on page 30 of this issue.

However, raw performance is only part of the equation; albeit possibly the most important and relevant when it comes to a games machine. But we also look at cost, of course; pre-built performance PCs always come at a price, and the price becomes even more exorbitant when you're looking at a performance laptop. There's simply no denying that you're going to get hit hard in the wallet if you go in this direction for your next PC, but to illustrate both the extra cost, and the performance hit you'll be taking, we'll be listing in amongst our benchmarking results the scores for the Deus Ex PC we reviewed last issue. Here are its specs:

Price: $4,179
Specs: Intel Core 2 Duo E8600 (overclocked to 4.25GHz); Zalman CPU cooler; GIGABYTE GA-EP45T-DS3R mobo; 4GB Corsair DDR3 @ 1333MHz; HIS ATI HD4870 X2 2GB DDR5; 1x 300GB WD VelociRaptor @ 10,000rpm, 1x 750GB Samsung HDD @ 7,200rpm; Samsung DVD burner; 620w Corsair PSU; Antec P182 case; Windows Vista 64-bit.

It's pretty much on a par price-wise, and is in fact cheaper than some of the laptops in this roundup.

Keyboard quality and layout is important in any laptop. On a machine where you're going to be hammering away at the WASD keys in any heavy session, you not only want good responsiveness, but also a tough build. In fact, overall build quality, from weight to ergonomics, is high on our checklist of things to look for. You'll be using this machine a lot, so it better be a comfortable experience!

We'll be looking at connectivity and IO options, of course, as it's very unlikely your PC is going to live in splendid isolation. At the very least you'll certainly want to use a proper mouse with it, but you may well be interested in hooking your machine up to a monitor or TV, or any other number of devices.

Extras are always nice, whether they be a Blu-ray player rather than a plain old DVD drive or a laptop bag to keep your new investment safe on the road. We'll be keeping an eye out for any little goodies that add that little bit of polish to the final product.

Finally, we're a pretty vain bunch here at Atomic, so we like our expensive toys to look the part, and that's something that gaming PC manufacturers are increasingly keeping in mind. Of course, when it comes to looks, beauty is very much in the eye of the beholder, but we'll try to judge each machine's style as objectively as we can.

Notebook specifications

Hardware/vendor	Asus G71	Toshiba Qosmio X300
Processor	Intel® QX9300 (3GHz)	Intel® Core™2 Duo T9400 (2.53GHz)
RAM	2GB DDR3 (1333MHz)	4GB DDR3 (1066MHz)
Graphics card/s	NV G9700M GT 512MB	NVIDIA® GeForce® 9800M GTX 1GB
Hard-drive/s	500GB 5400 rpm	200GB (7200rpm) 320GB (5400rpm)
Optical drive/s	BluRay Combo	DVD SuperMulti Double/Dual Layer Drive
IO	4xUSB 2.0, HDMI, Express Card, DVI Mic, headphone(SPDIF), 1394	4x USB, HDMI, Express Card, VGA out, Mic, headphones, 5-in-1 card reader, 1394
Power/Battery	180W Adapter, 8cell Li-Ion 5200mAh	8cell Li-Ion
Operating system	Windows Vista Ultimate 32-bit	Windows Vista Ultimate 32-bit
Screen	17" WUXGA	17.0" Widescreen WSXGA
Speakers	5.1 Dolby	5.1 Dolby
Card Reader	Yes	Yes
Extras	TV Tuner Bag Mouse Remote Headset	FM Tuner
Weight (battery)	4.22kg	4.2kg
Price	$4,799	$3,999

A laptop? For gaming?!

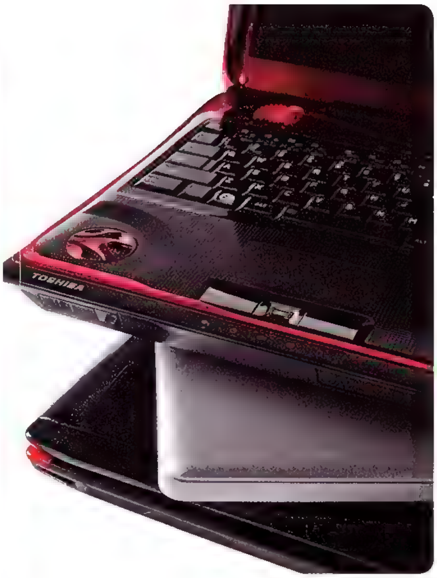
Remember back in our Gaming PC round up, when we said that, hey, really, if you're at all capable of it, you're far better off actually building a PC than buying one? It's more fulfilling, you can totally tailor the machine's spec to what you want, and – of prime importance – it's usually a helluva lot cheaper. You would think, then, that when it comes to gaming laptops, our advice would be an even more strident repeat of the build-your-own mantra... but it's not.

The modern laptop is an incredible piece of design. It manages to package the kind of performance you'd only ever get in a desktop a couple of years ago into a form factor you can literally slip under your arm or in a backpack. Yes, it's expensive – hella so – but with one of these machines in your possession any friend's house with a single PC in it becomes a gaming LAN.

For a pro-gamer it's an even better choice, as it means access to a gaming machine in any hotel anywhere. For an MMO player, it means the grind need never stop. For the large number of us who rent houses – sometimes small, cramped spaces – it means saving space and much easier house moves! When you consider that some of these machines come with Blu-ray drives and TV tuners as standard, you end up with a single machine that can cover off all of your entertainment needs.

And it's mobile.

Ultimately, yes, a desktop is always the first solution for performance, but if any of the above points tweak your interest, then think about one of these machines.



What we're not looking at

A lot of magazines that look at laptops spend a lot of time looking at battery life. We've commonly had to bang away at articles on the road, so we appreciate a laptop with some stamina as much as the next guy (or girl), but when it comes to a gaming machine, you're simply not going to get any meaningful life out of your machine if you're trying to unlock that last weapon on Call of Duty 4 on the way to work.

These machines – with perhaps one exception – are very much in the desktop replacement mould. We assume that any serious gaming sessions are going to be done with the machine attached to a powerpoint, either at home or at a LAN or a mate's place. All our testing is done with the machine plugged in.

So that pretty much sums up how we're rating these machines. Let's get to it... game on!

Notebook specifications

Macbook Pro 15in	Metabox M570	Metabox M860
Intel Core 2 Duo T9300 (2.53GHz)	Intel Core 2 Duo Processor T9400 (2.53GHz)	Intel Core 2 Duo Processor T9400 (2.53GHz)
4GB DDR3 (1066MHz)	4GB DDR-3 (1066MHz)	4GB DDR-3 (1066MHz)
NVIDIA GeForce 9600M GT 512MB	Nvidia 9800GTX 1GB	Nvidia 9800GTS 512MB
320GB 5400-rpm	320GB 7200RPM HDD	320GB 7200RPM HDD
8x slot-loading SuperDrive	DVD-DL	DVD-DL
2x USB, FireWire 800, Mini DisplayPort, Mic, headphones	3x USB, HDMI, DVI, eSATA, Mic, Headphones, 1394, RJ-45, RJ-11, bluetooth	3x USB, HDMI, DVI, eSATA, Mic, Headphones, RJ-45, RJ-11, bluetooth
lithium-polymer battery	8 cells smart Lithium-Ion	8 cells smart Lithium-Ion
Mac OS X v10.5 Leopard	Windows Vista Home Premium 64-bit	Windows Vista Home Premium 64-bit
15.4-inch (diagonal) LED-backlit widescreen display	17in WUXGA display	15.4in WUXGA display
Stereo	2.1 SRS WOW	Stereo SRS WOW
Yes	Yes	Yes
	Carry bag	
2.51kg	4.15kg	3.2kg
$3,999	$4,438	$3,509

Metabook M860

Much like Batman's Tumbler, this does come in black.

Price $3,409
Supplier P4Laptops
Website www.P4Laptops.com.au

We like fresh new happy faces in the Labs, and when we heard of the Metabox range put together by a build to order outfit in Perth, we just had to have a look. Too often it's thought that gaming machines – especially laptops – are the domain of big outfits like those on show here, or the Dells and Alienware's of the world. Not so, we say!

The M860 is one of the two Metabox boxes on test in this round, and it is also the cheaper of the two - almost the cheapest on test, in fact. But don't let that get in the way what is a very effective and thoughtful build from P4Laptops.

First up, the build. The top fascia (the back of the screen) bucks the PC trend for high gloss finishes and sports a machined aluminium finish with a silver trim. The aluminium continues on the keyboard surround, as well, providing a smooth yet tactile surface for resting your hands on as you type and play. The rest of the external chassis is black, and the silver trim continues around the touchpad and edge of the system. Taken as a whole, it's a remarkably understated, almost old-school feel that we can't help but appreciate. Everything about the machine is quite sturdy, too, though we did note a bit more flex than we'd like in the display; nor does it take a lot of pressure to unseat the plastic trim keeping the LED secure from its aluminium backing. Something it watch out for. The keyboard is a standard laptop model, that's neither poor nor exciting – but it is prone to dropping fast keystrokes. The touchpad is cramped, though it does have a handy slider function; then again, you'll probably be mousing on this machine more often than not.

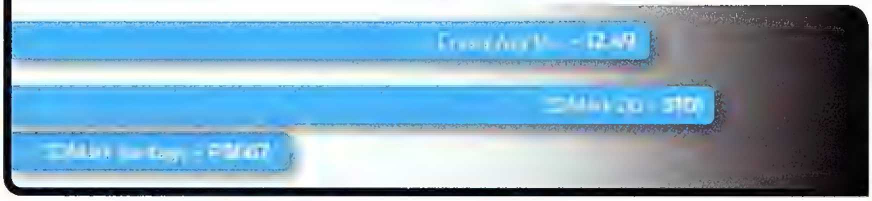
IO options are spread around the outer edge. Audio ports and IEEE 1394 are in front, along with status LEDs; 4-in-1 card reader, express card slot phone & network jacks and two USB ports are on the right, while the left side is kept occupied by a DVD burner. The rear houses another USB port, HDMI and DVI ports, and an eSATA port. It's a solid layout, but the right-hand USB ports are set too far forward to be comfortable while you're using a mouse. If they were the only USB ports, it would be an issue, but if you use a USB mouse and, say, a USB gaming headset, cabling and plugs might get in your way.

Under the hood is a T9400 running at 2.53GHz – not inconsiderable – and it's matched by a GeForce NVIDIA 9800GTS with 512MB of RAM and 4GB of DDR3 system memory (and yes there is a 64-bit OS installed - hooray!). It's a generous setup, and one that delivers surprising performance for the cost. In fact, it pretty much comes in on par with the more expensive (and massively more blinged) Toshiba X300. In Crysis it delivers 12.49 fps - just better than the X300, (albeit this is at a lower res due to niggling issues) - while in 3DMark06 and Vantage respectively it coughed up 9,101 and P3,667 respectively. Not desktop standards, for sure, but with tweaking you could get Crysis into a playable state, and less demanding games (anything that runs on the Source engine, for instance) will be more than comfortable. You'll want to game with headphones, though, as the included stereo speakers lack the depth of the 5.1 systems in this test.

What really impressed us about this Metabox system is its heat management. It gets warm, but never uncomfortably so, and the under-chassis fan actually manages to push some cool air up through the keyboard onto your fingers. On purpose it may not be, but it makes for very comfortable extended gaming sessions.

Matching a reasonable price with above par performance, we think the M860 hits a sweetspot few gaming laptops can reach.

Metabook M860



Overall
Understated looks, solid performance.

81%

Metabox M570

Does bigger = better?

Price $4,438
Supplier P4Laptops
Website www.P4Laptops.com.au

This is the larger of the two Metabox systems on test this month, and it's a plain-talking brute of a machine. It shares a lot of the look and feel of its smaller brother, but is at the same time superior in other ways, and actually worse again in more ways still.

It shares the same upper aluminium surface, but that's the only place you'll find that material on the M570 - the rest is plastic with a metallic golden trim. The keyboard is a full size mode; again, it's the standard notebook model set of keys you'll find on most mass market jobs, but it least it has a full numpad and openly spaced cursor keys. It feels a touch more responsive than the M860, but only by a hair. The touchpad is a shade bigger too, with the same fingerprint scanner as the other Metabox box (yeah, it amuses us every time). Though not quite so groovy and metallic as the M860, the wrist rest is pleasantly smooth and roomy, and instances of the heel of your thumb contacting the touchpad are thankfully rare. There are also quicklaunch buttons along the top of the keyboard for email, web browser, and to switch the notebook's fans from normal to quiet mode.

Connectivity options are also practically identical to the M860, though you will find an extra FireWire port.

It's not the most exciting story so far, we admit, but when it comes to performance, we were a little bit more impressed. The graphical heart of the M570 is a GeForce 9800GTX sporting 1GB of RAM. Cor! Otherwise it's spec is identical to the M860, including the 4GB of RAM and 64-bit OS. Our benchmarks responded with proper respect almost across the board... see that almost? The two 3DMarks were like begging dogs at a meat-packers convention (happy and eager, that is, not rabidly awkward), delivering 9,737 in 06 and P4340 in Vantage. It's a far sight better than our previous laptop performance king, the Alienware M17, and well ahead even of its closest rival in this test, the X300.

And now the almost – Crysis. This test has been making systems cry silicon tears of inadequacy since the demo was released well over a year ago, and not much has changed. Things started swimmingly enough, with the M570 tearing through at a hair over 17 fps during the first benching run. "Ho ho," we said, "this is a goer!" Only, in the next run, the average fps dropped to 14.11, then around 12 in the third... and it fell over in the fourth. Our ho-ho had become a no-no.

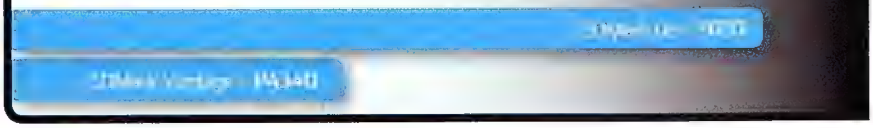
We can't think of any other culprit than poor heat management. Again, no single part of the chassis was getting particularly hot, but in this case that may be a bad thing. You want heat to radiate away from sensitive components; we suspect the gutsier graphics setup in this system is simply getting too hot under load and crapping out during successive runs. We played some live games, to see if we could replicate the problem in game, but we didn't find the problem repeated – that's something at least. But it's still a concern, and sadly a mark against the M570.

Both Metabox systems have solid screens with a glossy coating that really lifts colours and even makes Vista's Aero scheme palatable. The M570 is certainly the better multimedia machine, thanks to the addition of a subwoofer and larger 17in screen, but the treble is still a little dirty – again, stick with a pair of headphones.

We had hoped we were looking at a new performance winner with this notebook, but it just couldn't quite cross the line in the face of some serious – and far more consistent – competition.

Metabook M860

Crysis – **Did not complete**



Overall

Burn baby burn...

79%

ASUS G71

The Repubic of Gamers declares notebook independance!

Price $4,799
Supplier ASUS
Website www.asus.com

The RoG brand is well known for producing high end motherboards with all kinds of enthusiast-grade features, while ASUS itself is probably best known amongst the wider computing audience as the maker of fine notebooks. These two perceptions have collided, and the resulting collision is the G71 notebook.

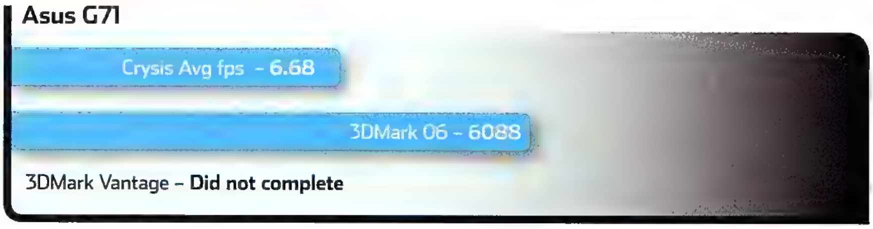
And it's big. Really big; it's both the heaviest on test, and takes up the largest desktop footprint. In fact the theme of bigness continues in its list of extras – TV Tuner, Bag, Mouse, Remote, and a Headset are all part of the package – and its price. The G71 is blessed with the heftiest price tag of all the machines on test this month: $4,799. So, what does nearly five grand of laptop get you?

Well, to be honest, as laptops go it's a helluva machine. But as a gaming laptop, where what you really want is glorious performance, not shiny ASUS-branded extras, it kind of lags behind the cheaper but more cleverly built Toshiba, and even the heat-prone Metabox M570 gives it a serious run for its money. ASUS has gone for CPU grunt over GPU performance, and opted for a combination of a QX9300 running at 3GHz on the clock and a GeForce G9700M GT with 512MB of RAM. Backed by a wasted 4GB of DDR3 (say after me – a 32-bit OS cannot address that much!), it simply cannot compete with the other top performers. Crysis results are particularly disappointing, bringing home a mere 6.68 fps - just about half the performance of the other dedicated Windows machines on test. 3DMarko6 is less drastic, but still a low 6,075 3DMarks; Vantage, on the other hand, could not even run. Of course, like a lot of high end machines, there's the possibility of switching the machine to 'performance mode', but, really, don't bother. We got all of an extra 13 3DMarks in our performance run. Woo! All that said, if you're gaming expectations aren't high - say, in the Counter Strike or especially the World of Warcraft realm, then this will likely be a good performer.

The stats are a real shame, too, as the G71 is otherwise a very striking machine. Its predominantly piano black finish with metallic red highlights produces an effect far less garish than Toshiba's effort, but still very much not a 'plain old notebook'. The IO ports are generous and well positioned with mousing in mind, and the side ports are all protected by magnetically clasped doors. The keyboard is a little on the poor side, producing a lot of failed keystrokes, but it's at least full size. There's a host of neat little notebook touches, like customisable lighting, a programming LED display (that defaults to CPU and battery readings, but can be set up for email and messaging alerts) and a touch sensitive button to switch off the touchpad.

The other hardware choices are similarly luxurious. Two 500GB drives (though they are a little on the slow side at 5400rpm) are split into four partitions, one for the OS and three for data. On top of that there's also a Blu Ray drive instead of the standard DVD burner, whihc really lifts the G71 into the super multimedia arena. With a 5.1 Dolby speaker setup watching films on the generous 17in display is quite an experience. But, again, ASUS has made some odd choices in its software bundle that kind of defeat the excellent hardware - like no bloody Blu Ray playing software pre-installed! Insert an expletive here to show our frustration. Yes, there is Blu Ray software on disc, but really, why should anyone who pays this much have to do anything post-purchase to get what they paid for actually working?

As a notebook, the G71 is pretty well featured, though it does have a few annoying issues. As a gaming notebook, it falls even further behind the pack, thanks to lacklustre performance where it counts. You do get some great extras, but they won't help Crysis run any better.



Overall

Good features cannot make up for poor performance for the price.

72%

Toshiba Qosmio X300

Nothing says laptop like carbon fibre panelling.

Price $3,999
Supplier Toshiba
Website www.toshiba.com.au

We, along with a whole host of other tech journos, were at the launch event that featured the X300. Without exception, every one of us was consistently drawn back to this very machine. It's gloss metallic red shell and fire-pattern finish, while garish, was a siren to us. The previous Tosh gaming laptop, the X200 was something else, but this is something else again.

It is not the fastest machine on test, and given that Alienware and Dell couldn't supply us gear in time for this round up, it may not even be the fastest in the market. But it nonetheless stands alone for its unique approach to laptop looks. We say 'unique' because even we can't decide whether we like it - opinions seem to change daily on the translucent shell, machined metal speaker covers and all the rest of the bling that the X300 sports. With such a bold design, it's not going to be liked by all, but like a performance super car, looks are only part of the package.

It's not quite as well-featured as the G71, but what bells and whistles it does have are all solid. It's connectivity options include HDMI and external monitor support, though not DVI - an odd lapse. Alongside its audio ports, on the right of the chassis, is a volume wheel, a faeture that only the G71 matches. It has card readers to handle both express cards and a variety of smaller formats, and eSATA capability. The keyboard is not only full sized, but there is generous space between the alpha numeric keys and the function keys, which themselves are spaced along the classic 4-4-4 design. Plus, not only is it well laid out, but it's also one of the most responsive and fluid feeling keyboards on test - our typing was significantly more accurate, and the key travel was deep enough to deliver good gaming feedback. We will say, though, that we missed the G71's off-switch for the touchpad - we had to turn down the touchpad sensitivity as low as it would go to be able type comfortably without sending the cursor off to raid and ultimately take over other, more complete paragraphs.

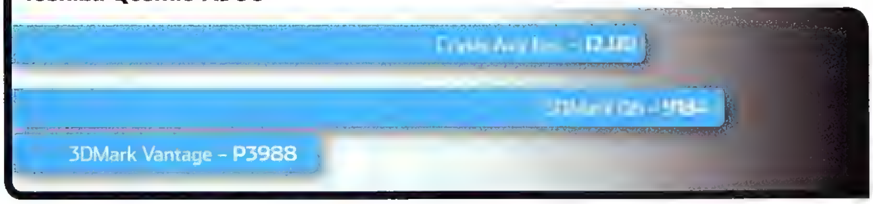
There's only three USB ports, which seems small for a machine this size, but they are well placed on either side of the chassis, and not in the way of any frantic in-game mousing.

The whole thing is surmounted by a 17in widescreen WSXGA display. It's not the most crisp display on test, but it's certainly clear and bright enough, and very easy on the eyes. It's pixels are pushed by a GeForce 9800M GTX with a mighty 1GB of RAM, and the performance of the X300 shows the dividends that hardware pays. Crysis returns a solid 12 fps - not the highest, but impressive nonetheless, and certainly well above our previous performance king, the Alienware M17x - and in 3DMark06 and Vantage the numbers returned were 9,184 and P3988 respectively. As we've said, the cheaper Metabox delivers results very similarly, a touch above and below, but we still think the X300 has the edge. Here's why.

Quite apart from the over the top design (which could well be a deal breaker for some), you get a much better sound setup. The Dolby 5.1 speakers on the X300 are worlds ahead of anything else in this test bar the G71, and larger screen means much better gaming and video presentation, especially with the multimedia controls above the keyboard. You also get more storage - 520GB spread over two drives - and easily the best keyboard in the roundup, both for working and playing.

The X300 is something you might scoff at just looking at it (especially if red isn't your favourite colour), but that you start to like the minute you get down to using it. It's not the fastest – but it's fast enough – but then again nor is it the most expensive, by quite a margin. What it is, is just about right if you're looking for a full-featured, high performance laptop.

Toshiba Qosmio X300



Overall
Great for those into ricey laptops, but not for everyone.

86%

NRG™

Hardcore Gaming Systems

STORM

Intel® Core™ 2 Extreme QX9560 Quad Core CPU
3.0GHz Overclocked to 4.2GHz
NVIDIA 790i Ultra SLI Motherboard
Corsair Dominator 4GB 1600MHZ DDR3
2 x NVIDIA GTX280 1GB SLI
Alphacool Water Cooling System
2 Terabytes RAID 0 HDD Space
Blu-ray Optical Drive

TORNADO

Intel® Core™ 2 Duo E8600 CPU
3.0GHz Overclocked to 4.0GHz
Intel X48 Motherboard
Corsair Dominator 4GB 1066MHZ DDR2
2 x ATI HD4850 512MB Crossfire
1 Terabyte RAID 0 HDD Space

TYPHOON

Intel® Core™ 2 Duo E8400 CPU
3.0GHz Overclocked to 4.0GHz
Intel® P45 Motherboard
Corsair Dominator 2GB 1066MHZ DDR2
1 x ATI HD4870 512MB GDDR5
640GB RAID 0 HDD Space

intel
Channel Partner
Premier
Member 2008

Built Right.
Your technical
experts for Intel -
based solutions

ALTECH
COMPUTERS

WWW.ALTECH.COM.AU/NRG

ADELAIDE
Unit 4
9 William St
Mile End SA 5031
Tel (08) 8257 9999
sales-sa@altech.com.au

BRISBANE
1/30 Bernoulli St
Darra
QLD 4076
Tel (07) 3017 2000
sales-bris@altech.com.au

MELBOURNE
1 Torteval Place
Clayton
VIC 3168
Tel (03) 8588 7777
sales-mel@altech.com.au

PERTH
Unit 2
8 Carbon Crt
Osbourne Park WA 6017
Tel (08) 9242 8822
sales-wa@altech.com.au

SYDNEY
Unit R
10-16 South St
Rydalmere NSW 2216
Tel (02) 8831 9999
sales-syd@altech.com.au

ALTECH COMPUTERS CORPORATION is responsible for and has verified any statements or computer system product specific claims contained herein.

Intel, the Intel logo, Intel Core, and Core Inside are trademarks of Intel Corporation in the U.S. and other countries.

intel
Core™2
Extreme
inside™
Extreme
Performance

Apple MacBook Pro

No, we're not kidding. A Mac.

Price $3999
Supplier Apple
Website www.apple.com.au

When we say the MacBook Pro looks hot, we don't just mean it's looks. Yes it is a strikingly stylish object of desire, but it is also capable of reaching truly scorching temperatures under load. How hot? Well, let's just say you should keep things you value (heat sensitive surfaces, small children, your groin) well away from this machine. It's very much a notebook, not a laptop.

Now, with that warning out of the way, we can talk about why a Mac has made it into the pages of your favourite PC mag.

Well, the truth is, it's as capable a PC as anything else in this test, thanks to Leopard's version of the Mac OS X, and its Boot Camp software. With this, you can install Vista on a partition and merrily compute away. "La la la," you can sing, "I'm on a PC!". It can be fiddly, but we're enthusiasts, right? And, the truth is, that once Vista's running and you've finessed the right drivers into recognising all the hardware, it's actually a pretty damn good experience.

In terms of performance, we'll admit - the Pro is not a star. But with Crysis hitting 6.89 fps (at a lower res than standard, thanks to the Mac's smaller display), and 3DMark06 scoring 5,797 (Vantage would not run due to resolution issues), you end up with a machine that's actually on a par with the G71. Yes, the Pro's 9600M GT and its 512MB of RAM is technically doing less work, but let's not quibble - these are very good numbers for a Mac. It's not a hardcore gamer's machine, but for someone playing lower specced games that's not going to be an issue.

When you think about it, though, it's really only the logo and OS that's 'Apple'. The CPU is a Core 2 Duo running at 2.53MHz, it's got 4GB of DDR3 (so yeah, make sure you install a 64-bit version of Vista!), and the graphics committee is spearheaded by the aforementioned NVIDIA card - that's a respectable PC spec right there. And with an outstandingly bright and clear display, with an excellent viewing angle - perfect for showing off headshots to your mates.

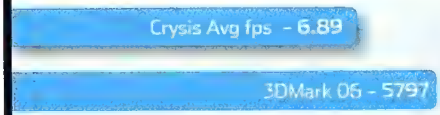
Of course, you do make a lot of trade-offs for that aura of Steve Jobs coolness. Connectivity is limited; there are only two USB ports (though they are on the far side of the system, so well positioned for gaming), FireWire 800, audio ports and a mini DisplayPort. You only get stereo speakers, too, and while they are slightly better than those in the Metabox solutions, they still struggle with high notes. And Beethoven.

You do a get a good keyboard though, one of those funky and flat scrabble-key style ones that even Sony has started putting into its Vaios. It's a surprisingly good keyboard too, and while it doesn't quite have the travel of Toshiba's keyboard, it offers accurate typing and good gaming tactility (is that a word? It is now). The touchpad is a Multi-touch device, though if you're planning on living in Windows you'll not be able to take advantage of that neat technology. It's also a single piece of glass, without buttons - it is the buttons. It takes some getting used to, but like many Apple devices, is actually quite an elegant and simple solution. It's position sucks LN2, though, so you'll want to turn it off when you're mousing or even typing for any length of time.

At the outset, we got the Pro into this roundup because of our lingering respect for Apple hardware, and because we also can't resist hanging a lot of grief on it at times. But in the end, this is actually a viable choice for mobile gaming. It's the sleekest machine on test, quite possibly the most stylish, certainly the lightest, and it can just about handle a lot of modern titles. There are still some forlorn hopes of companies putting out titles for the Mac OS, as well as success stories like Blizzard, but with Boot Camp you can easily go the Windows route and open a far greater world of gaming possibilities. And all for what is, ultimately, a very competitive price when you look at some of the other machines on offer.

Go Steve.

Apple Macbook Pro



3DMark Vantage – **Did not run**

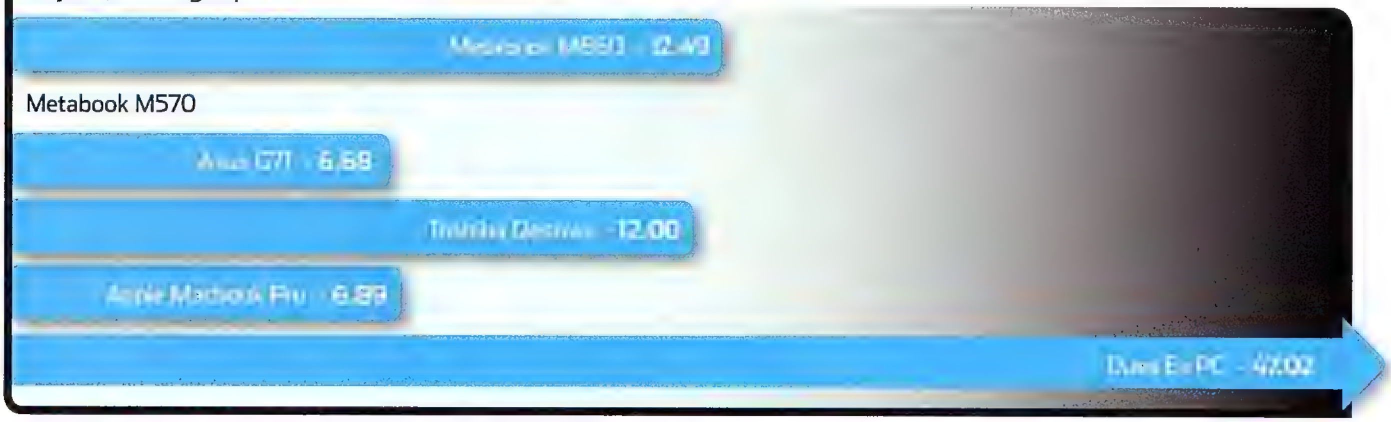
Overall

Not the best, but good in a pinch. Comes with optional bread toaster add-on.

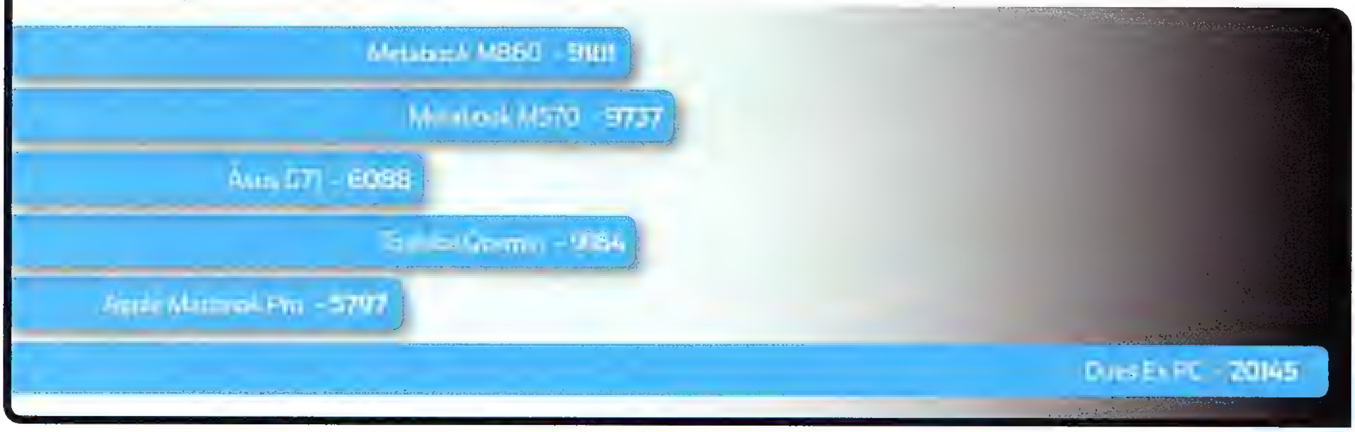
73%

Comparison graphs

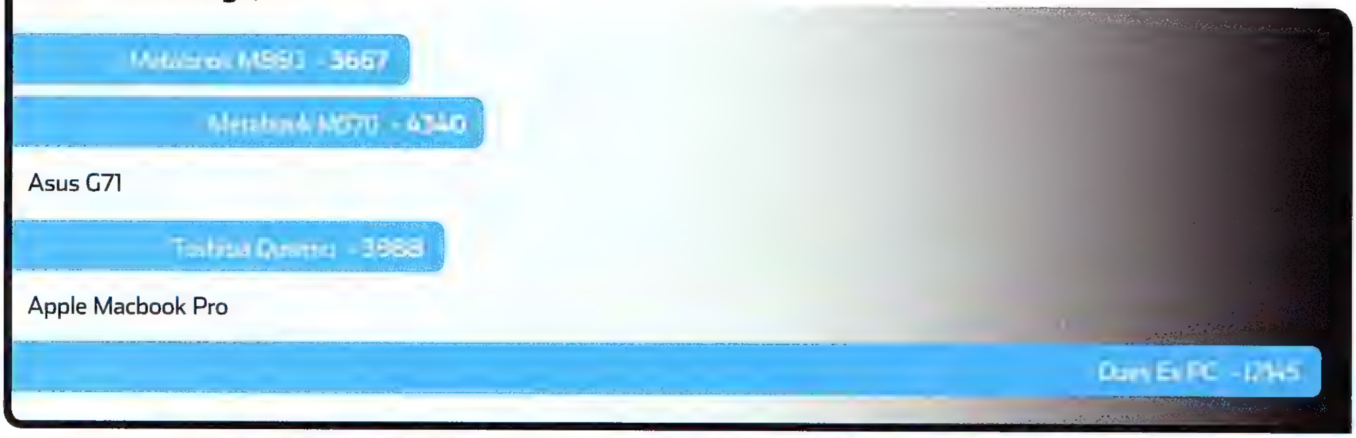
Crysis, *Average fps*



3D Mark 06, *Score*



3D Mark Vantage, *Score*



Conclusion

So, what have we learned after pushing these expensive little machines to their limits?

Well, first up, we're pleasantly surprised – laptop performance is steadily increasing, even when compared to the top mobile performers of just a few months ago. In some instances we've seen increases in gaming power of up to 20 per cent over the previous laptop king, the Alienware M17x. And, at the same time, that kind of performance is getting steadily more affordable – we're not talking build-your-own-desktop affordable, of course, but prices are definitely dropping.

But, more importantly, we've learnt that laptop (well, notebook, given how hot some of these machines run) gaming is more viable than ever before – and it's only going to get better. NVIDIA is putting a lot of money into pushing its mobile hardware to bigger and better things – assuming heat management can keep up.

And that's really the one thing that's keeping these small format powerhouses in check.

In the PC world, performance equals heat, and if you can't dissipate that heat, you're in trouble. You're either going to end up with steadily decreasing returns from your hardware – as demonstrated by the otherwise excellent Metabox 570 system – or you're going to have a machine that runs pretty well, but practically blisters your skin if touch the wrong spot for even a moment – like the egg-cookingly hot MacBook Pro.

The other problem with gaming laptops is of course the price – we've roped in last issue's Deus Ex PC to compare what kind of results the same (or less, in some cases) money can get you in an off the shelf desktop, and the raw comparison is, well... damning. But that's the numbers, and really, if you're in the market for a gaming laptop, raw performance isn't your goal – mobility is, the freedom to game where and when you want, with whomever you want. As game reviewers, for instance, we've commonly used machines like these to make our lives a helluva lot easier on the road, or even in the office. Aside from the maniacal level of engineering that you're paying for in these machines, you're also paying a premium for that ease of use.

Plus, remember – we test at very high specs. If you're willing to tweak settings even the MacBook Pro is capable of hitting some 17-odd frames per second in Crysis.

But, of course, you don't want to go over the top, and we think the ASUS G71 does just that. It's a killer build and a great package (bag, mouse, headset and more), but any gamer worth their salt will want their own bag, their favourite mouse, the headset they like best... all those extras would just end up gathering dust or be tossed in the bin. The Blu Ray drive is a nice addition, but it also jacks the price up considerably, without doing anything to help some of the most lacklustre numbers in this roundup. In essence, the G71 wants to be cool, but really, it's just a fancy high-end notebook that would be better off in the hands of a travelling executive than a travelling pro-gamer.

Which, oddly enough, leaves us with two of the cheaper options battling it out for mobile supremacy.

And the winner is...

... harder to pick than you might think. And it's largely open to interpretations of style...

The Metabox M860 and Toshiba's Qosmio X300 certainly make for strange bedfellows. The M860 is a real cut-down wonder, actually coming in near the top of some of our gaming tests. It doesn't look like much, and lacks a lot of the extra features of its brethren, but it's got it where it counts, as well as being the out and out cheapest machine on test. And then there's the Tosh.

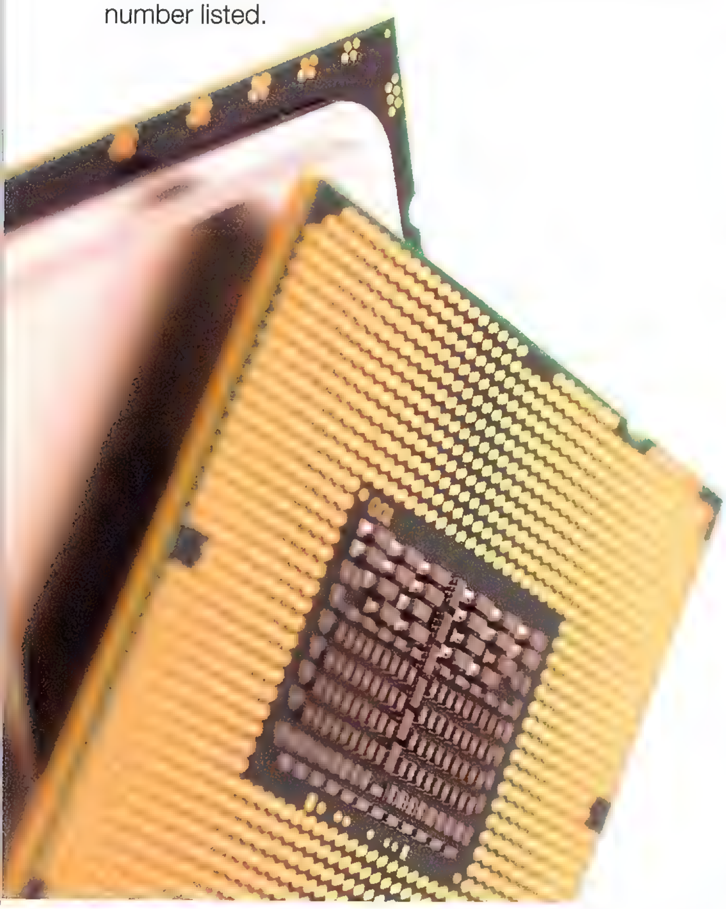
Every time we look at that machine, with its racing car colours and sweeping design, we feel differently about it. We hate it one minute, then love it the next. But, say what you will about it... it at least makes a statement.

On top of that, it's also a surprisingly consistent performer, with a great screen, 5.1 speakers and a very reliable keyboard. It's a near run thing, but nor is it the heaviest machine on test, another thing we like about the Tosh. Quite simply, it's the machine we want to take with us on our next trip OS.

Or to a mate's place. It's your call. **DH**

KITLOG

There's nothing sexier than new kit. And whether you need to horde your pennies (Budget), want the most power for your dollar (Performance) or own a small mansion and a collection of sports cars (Extreme), we're here to help with this handy matrix of Atomic recommended products. You may find your needs fall between categories – that's okay, just mix and match to suit your budget! Each piece of kit has been reviewed hands-on in Atomic, so if you want to learn more, look up the issue and page number listed.



www.eyo.com.au

Your genuine online tech store

proven and trusted for more than 10 years

eyo™

BUDGET

CPU

AMD Phenom X4 9550

PRICE $170-180

A well performing Quad core for those on a budget, that won't break the bank and doesn't get too hot.

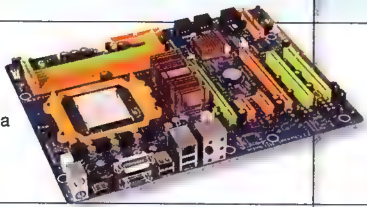
MOTHERBOARD

BIOSTAR TA790GX A2+

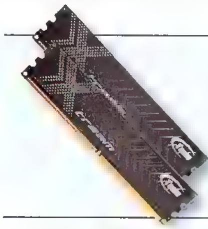
PRICE $150

A great overclocker with fast integrated graphics - you don't even need to buy a graphics card with this one!

Reviewed in Issue 93 – Page 34



MEMORY



TEAM Xtreem Dark PC2-6400 C4

PRICE $60

These modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.

Reviewed in Issue 80 – Page 56

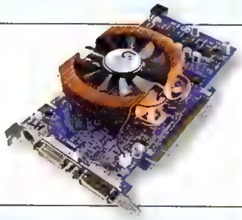
VIDEO CARD

GeForce 9800GT 512mb

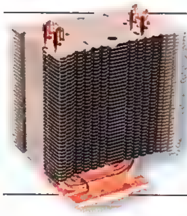
PRICE $150-160

A 55nm card that remains very cool and fast, with plenty of headroom for overclocking and a price that speaks volumes about it's value. Great performance too.

Reviewed in Issue 92 – Page 49



COOLER



Noctua NH-U9B

PRICE $72

Labs tested to be the top of the cooling game without breaking the bank (or making you sweat – haha)

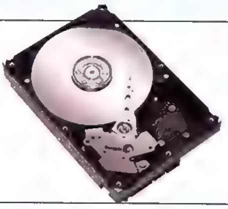
Reviewed in Issue 89 – Page 36

SYSTEM DRIVE

640GB HDD

PRICE $90

The absolute best value for money, with two 320GB platters giving great speed and low latency.



DISPLAY

AOC 2216Vw

PRICE $240

A great 22" widescreen for any purpose, with accurate colour reproduction and a bloody good price.

Reviewed in Issue 94 – Page ??

SPEAKERS

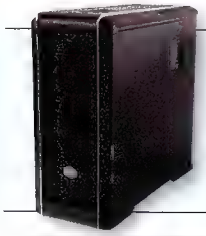
Steelsound 5Hv2

PRICE $120

Great gaming headphones with inbuilt mic, but music quality falls short.

Reviewed in Issue 73 – Page 43

CASE



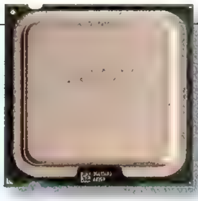
Cooler Master CM690

PRICE $100

A sturdy, spacious case with plenty of airflow and more than enough room for the biggest of systems. Some stores even have a windowed version!

Reviewed in Issue 84 – Page 51

PERFORMANCE



Intel Core 2 Duo E8400

PRICE $190

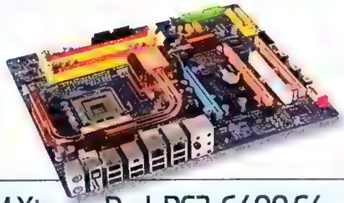
A processing powerhouse, now affordable and overclockable like buggery. The Q6600 is the best buy, at about $240.

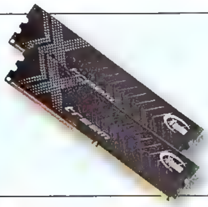
GIGABYTE EP45-DS4P

PRICE $195

A P45-based mobo with a bevy of features and a good overclocking potential.

Reviewed in Issue 93 – Page 55





TEAM Xtreem Dark PC2-6400 C4

PRICE $60

Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.

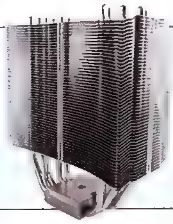
Reviewed in Issue 80 – Page 56

Sapphire HD4870

PRICE $319

One of the best price to performance cards on the market. Welcome back Red!

Reviewed in Issue 92 – Page 36



Thermalright Ultra 120 Extreme

PRICE $65

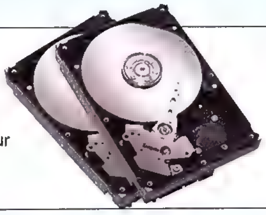
Tower cooling that will keep your tower cool. Whack a Nexus 120mm fan on for near silent cooling.

Reviewed in Issue 89 – Page 33

640GB HDD - Times two!

PRICE $90x2

All the speed of dense platters, with the peace of mind to be able to back up your precious files.



LG W2252TQ

PRICE $270

You'll pay a little more for this 22" screen, but the colours are amazing, with no backlight bleed and no ghosting.

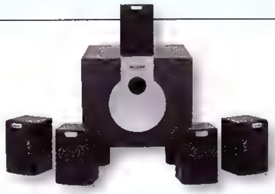
Reviewed in Issue 94

AVLabs AVL325

PRICE $210

Slightly aged speakers now, but these still offer a great 5.1 sound experience - if you can find a set.

Reviewed in Issue 64 – Page 50



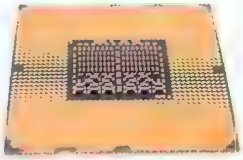
Cooler Master HAF 932

PRICE $180

A massive case with three 230mm fans that can move enough air to qualify as a small aeroplane. And quiet to boot.

Reviewed in Issue 93 – Page 48

EXTREME



Intel Core i7 i965

PRICE: $1999

Intel's latest and greatest chip, complete with an unlocked multi, 45nm process, and a massive pricetag. Good for what ails you.

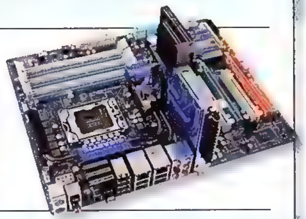
Reviewed in Issue 95 – Page 38

GIGABYTE EX58-EXTREME

PRICE $530

GIGABYTE has had the best overclocking board thus far, and therefore the perfect mobo for a beastly rig.

Reviewed in Issue 96 – Page 38



Corsair Dominator TR3X6G1600C8D

PRICE $585

Nothing says memory bandwidth like a triple channel kit of speedy, yet imposing RAM - a whole 6GB of it!

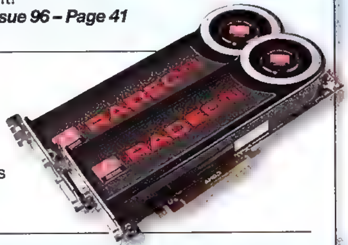
Reviewed in Issue 96 – Page 41

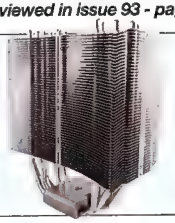
ATI 4870X2 2GB x2

PRICE $650 x2

All the performance of two cards, with the size of one. Makes an ungodly amount of heat, but matches this with unbelievable performance.

Reviewed in issue 93 - page 32





Thermalright Ultra 120 Extreme

PRICE $65

The current best air cooling - just make sure you grab a LGA1366 mounting kit to use it!

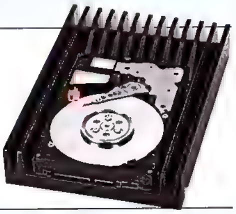
Reviewed in Issue 89 – Page 33

WD 3000GLFS VelociRaptor

PRICE $349x2

The fastest desktop HDD we've seen yet. Grab two and RAID 'em, or mix 'n match with a 640GB for storage capacity and speed.

Reviewed in Issue 90 – Page 52



Dell 3008 WFP

PRICE $2199

It's enough to make a grown man weep and beg. Or, at least, that's what we'd do for one of these simply gorgeous displays.

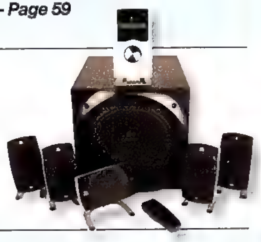
Reviewed in Issue 88 – Page 59

Logitech Z-5500D

PRICE $319

Able to play the 'liquid gold' that is DTS 96KHz/24-bit, this 5.1 beast can wreck both home and hearing alike.

Reviewed in Issue 48 – Page 56



Lian Li X-2000

PRICE $575

The only case we've had in that has made the editor orgasmically happy, and is drenched with quality in every one of it's brushed aluminium panels. Definitely a case to show off your system-building prowess!

Reviewed in Issue 91 – Page 54

www.eyo.com.au Trusted Brands. Proven Company.

Next stop, clay tablets

Dan Rutter rediscovers the attraction of printed paper

I have just spent a while playing with an unusual data storage option.

That unusual storage option is... paper.

But not paper with boring old plain text on it. Paper with arbitrary digital data on it.

Paper is a great format on which to store really important information. Thieves seldom bother to steal paper, magnetic fields or power surges can't damage it, and it can tolerate much higher temperatures than any digital storage system. And if those high temperatures are created by a house fire, paper in a simple wooden box, like the bottom shelf of a chest of drawers, is actually very likely to survive.

> 'Matrix Codes' are the two-dimensional barcodes that're popping up all over the place these days.

If your house burns to the ground then any paper not in a fireproof safe will of course be gone along with everything else. And metal filing cabinets pass heat through, sacrificing their contents to save themselves. But even if the fire brigade take half an hour to turn up, paper in a wooden bottom drawer will probably survive.

And ordinary cheap printer paper today is acid-free, so it won't go brown and fall apart like an old paperback book.

Okay, if the roof leaks over your backup, then a Flash drive will probably come out better than paper would. But apart from that, paper's pretty awesome.

You can fit something in the order of twelve thousand characters of small-but-legible eight-point text on one sheet of A4 paper. At one byte per character, that's 11.7 kilobytes of data per one-sided page, or more than 87 pages per megabyte. More, if you print all tiny and squinty.

You can do a lot better than that, though.

'Matrix codes' are the two-dimensional square barcodes that're popping up all over the place these days. Matrix codes were only meant to be used to store bar-code-y sorts of data, so many of them have hard format limits that make sure they fit on product packaging and can be 'scanned' with the low-res camera in a mobile phone. This means they top out at a few kilobytes of data per matrix.

This is a bit of a shame, though, when you realise that fitting two or three kilobytes into a one-inch square means a single sheet of A4 paper could hold at least a couple of hundred kilobytes. Even if you include plenty of error-correction redundancy to minimise the chance of silverfish-related data loss.

200 kilobytes ain't much if you're backing up your whole hard drive. But it's actually pretty decent for a lot of really important files. Financial data, program source code. Your university thesis...

There's a free Windows paper-backup program, inventively called 'PaperBack', which you can get from **ollydbg.de/Paperbak**. It works with all normal printers and scanners.

PaperBack can cram about half a megabyte of data onto a 600dpi A4 page, though my cheap laser printer topped out at 180k per page. PaperBack includes compression tuned to work very well with plain text, too, so it's an ideal solution for backing up written works, program source code, lists of passwords and exported data from your accounting program. A 746-kilobyte plain-text version of Charles Dickens' A Tale Of Two Cities only took up about one and a quarter pages, even using my crummy printer.

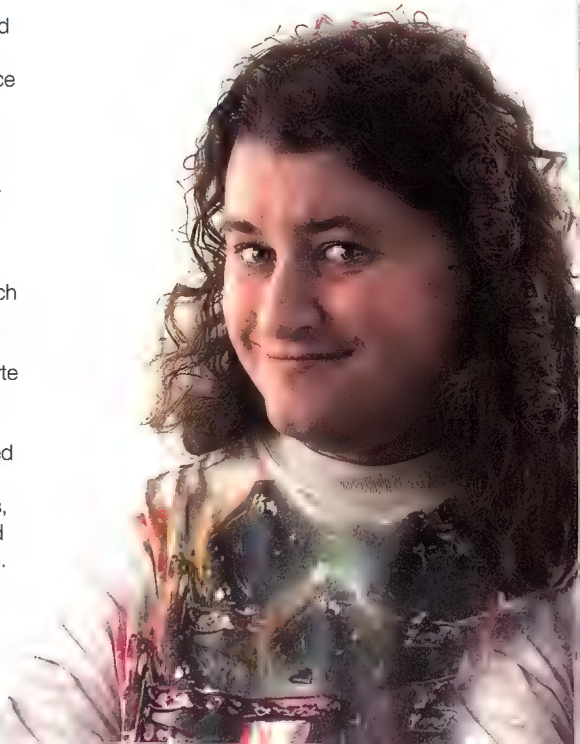
PaperBack even has built-in encryption. Or you can encrypt your data with something else.

If you suspect that the computing world as we know it will no longer exist when you have to restore your backup, you can print out the not-terribly-long C source for PaperBack decoding. People fifty or a hundred years from now may well be able to compile that.

At 180 kilobytes per page, you'll need 5,825 pages of A4 copy paper to back up a gigabyte of data. And a few toner cartridges. And a paper-slave.

Ten years of my business accounts zip down to about 2.7Mb, though. That's only fifteen cheap-laser pages. Works for me.

Dan Rutter compresses down into a handy self extracting binary. dan@atomicmpc.com.au



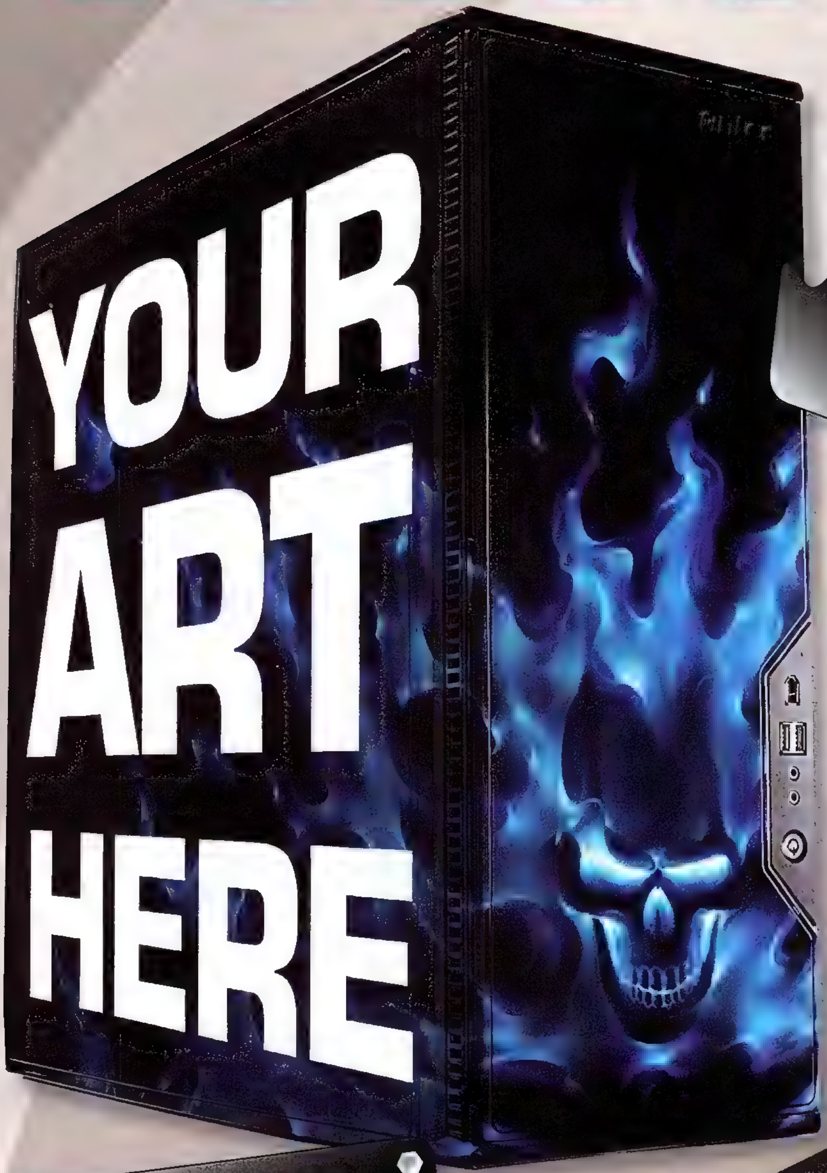
Verbatim is a brand associated with quality and high-end technology, this can be seen in the new Gaming Mice range. With advanced design, innovation and durability, Verbatim's new Gaming Mice are ideal for the gamer who demands precision from their mouse. Features include:

- Adjustable dpi setting: 800 to 3200 dpi "on the fly" sensitivity adjustment
- 7 programmable buttons
- 7 dpi settings available via the software (400 – 3200dpi)
- Weight adjustment for your preferred set up
- Gamer Toolkit Software included enabling keyboard key/ mouse button combination setting.
- Support with 3 group Macro setting; saved to the mouse directly

Verbatim®

www.verbatim.com.au

SUBSCRIBE



worth $929

ANTEC P182
Performance One case
with
Custom airbrushing

DEUS EX TECHNOLOGIES
For more information about Deus-Ex Technologies, go to
www.deus-ex.com.au

ATI 4870X2
Graphics Card

worth $850

Subscribe online @ www.atomicmpc.co

& UPGRADE YOUR KIT!

Subscribing to Atomic this month gives you a chance to unleash your inner artiste and take a performance leap.

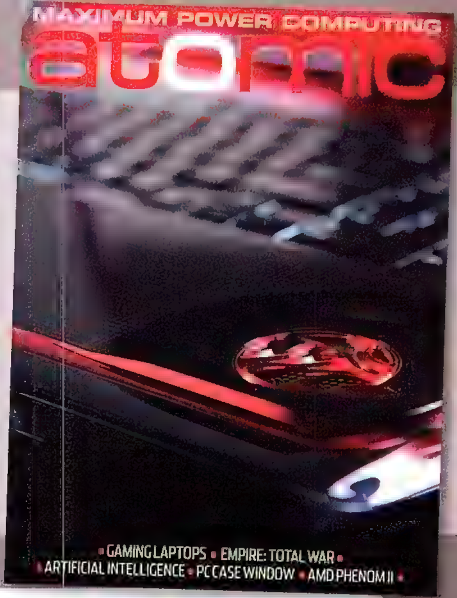
Courtesy of Deus-Ex Technologies, you'll score a brand new Antec P182 case which they'll airbrush to within an inch of it's life with what ever your imagination can conjure up... we can think of a few things ourselves already!

To add to this bounty and to boost your present gear to the limits of what's presently possible, the good people from ATI are throwing in a 4870X2 graphics card. First reviewed in Atomic #93, it's our current performance king!

This combined prize pool is valued at almost $1800. Woot!

All you need to do for your shot is subscribe to Atomic via our website and let us know - if you had the choice, what would you get airbrushed onto your case?

Go to www.atomicmpc.com.au/subscribe


MAXIMUM POWER COMPUTING
atomic
GAMING LAPTOPS • EMPIRE: TOTAL WAR •
ARTIFICIAL INTELLIGENCE • PC CASE WINDOW • AMD PHENOM II •

EXCLUSIVE COVER!

WHY SUBSCRIBE?

1. SAVE SOME HARD EARNED DOLLARS
2. WIN A CUSTOM AIRBRUSHED CASE & ATI GRAPHICS CARD!
3. DELIVERED TO YOUR DOOR, OR MAILBOX, OR A SECRET HIDEAWAY
4. FULL MONEY BACK GUARANTEE
5. THE GREATEST TECH MAG IN THE GALAXY, DELIVERED!

SUBSCRIPTION PRICES

Australia

1 YEAR (12 issues) – $69.95 **SAVE 35%** off the newsstand price

2 YEAR (24 issues) – $120.00 **SAVE 44%** off the newsstand price

NZ

1 YEAR (12 issues) – NZ$75.00 **SAVE 34%** off the newsstand price

2 YEAR (24 issues) – NZ$137.00 **SAVE 40%** off the newsstand price

Offer available until 10/2/09. Only available to new or renewing subscribers to Atomic during the promotional period. For terms and conditions see Page Code: CI/A97

m.au/subscribe or call (02) 8227 6499

THINK YOU CAN WRITE A BETTER REVIEW?

Do you think we missed the point on your favourite game? Then tell us. Do you think Nehalem is over-rated? Share your opinion. Tell us the pros and the cons of the gear you've got that we've reviewed, give it a rating and Bob's your uncle.

The most interesting and insightful user reviews could win an AOC "Jenio" Monitor valued at $349.00 or 1 of 5 Dr Who Series 4 Box Sets.

To be in with a shout, you have to be a part of the Atomic online community. What's that? You're not yet registered? Well, join on up! It's easy, makes your friends jealous, and members of the opposite sex desirous of your company. As well as then being able to write your own product review, you'll also have access to one of the best and most vibrant tech forums on the planet.

Go to

www.atomicmpc.com.au/?yourreview

for more info!

See website for terms and conditions. Authorised under permit numbers NSW Permit No: LTPM/08/00546, ACT TP 08/03145

TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

This month's tutes see a mix of crazy geekery and old school skills, coming together to give you the kind of learning that only Atomic can deliver.

First off the starting line is Jake Carrol who has the final piece of building a corporate grade file server using only the finest of high end software. Then our case modder supreme, Ron Prouse, returns to one of the staple case mods – adding a window to your PC. A lot of cases come with one as standard, these days, so Ron's found a funky acrylic panel that'll make your custom PC literally shine out from the rest.

Chris Taylor then takes time out from his explorations into Artificial Intelligence (see p.22) to keep us up to date with education information. This issue he takes a look at the red-headed step-child of tech learning in Australia – New South Wales. What do the Waratah State's universities have to offer the budding techie? Only one way to find out!

TUTORIAL CONTENTS

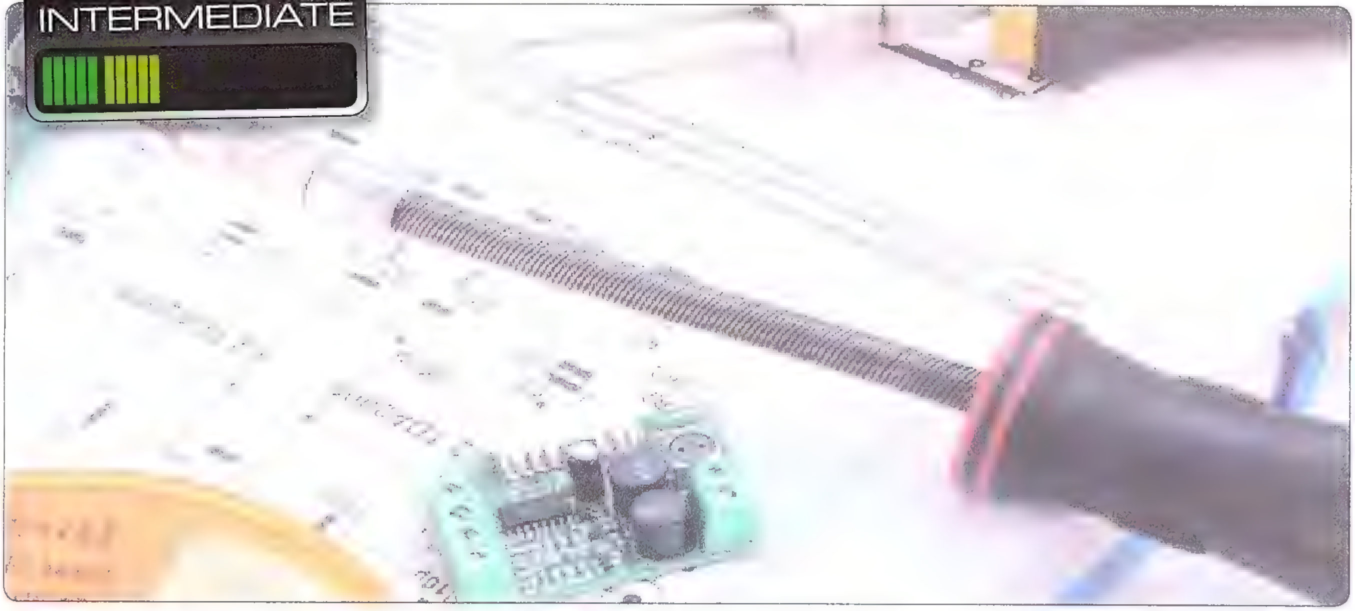
ZFS File Server build, pt2 70
All about setting up Open Solaris to build the ultimate in File Servers.

Fitting a Case Window 74
It's an old classic, but Ron Prouse give it some new polish in this step by step tutorial.

Atomic.edu 78
Everything you ever wanted to know about universities in New South Wales and what they can offer you.

Geec Chic 81
Zara Baxter talks online comics and social learning.

DIFFICULTY
INTERMEDIATE



ZFS File Server Build, pt2

Still cackling, **Jake Carrol** finally gets down to brass tacks on his next gen file server.

Still want to be a storage hero? This month, we go through the build process involved in the creation of a high performance, next generation fileserver technology, for your home. Join us, as we put together the ZFS fileserver.

Bricks and clicks solution

We have a components list from last month (AtomicMPC Issue #96). Your components can differ a little – we're generous like that. We only suggest the list in issue 96 as a means to keep you close to the Sun Solaris Hardware Compatibility List (HCL) and give you optimal behaviour.

Considerations:

- You'll need a sizeable, well appointed case. A poorly laid out case will only make this task harder.
- We recommend 8+ SATA ports.
- Make sure you have enough juice! Don't skimp on the PSU.
- Turn off any RAID functions on the motherboard.
- We are dealing with a high end UNIX OS here. We're a long way from Ubuntu, Dorothy. Arm yourself with basic understanding before getting in too deep. We assume knowledge of basic concepts in UNIX.

Come back to the article when you've got all the hardware assembled, posting and detecting all devices. Burn your Open Solaris DVD off. Throw it in and boot!

The installation of Solaris

Sun has tried to make installation simple for users over time, but, inevitably, to achieve power, flexibility and function, the underlying configuration is generally complex.

1. Boot from DVD and load into the GRUB menu.
2. Select the graphical installation option, if it's available to you.
3. Go through the configuration options slowly and read all that you have available to you.
4. We recommend you set up your system volume (OS install) on a single physical disk, rather than partitioning at this stage. Make a note of the disk name you install the OS on.

Once you get to the point where your host can reboot and 'come up' successfully, it is time to login for the first time and start carving up some storage pools!

If we take a look at what disks we have available, we can work out what modules we will target for zpools.

```
bash-3.2# format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c0d0 <DEFAULT cyl
```

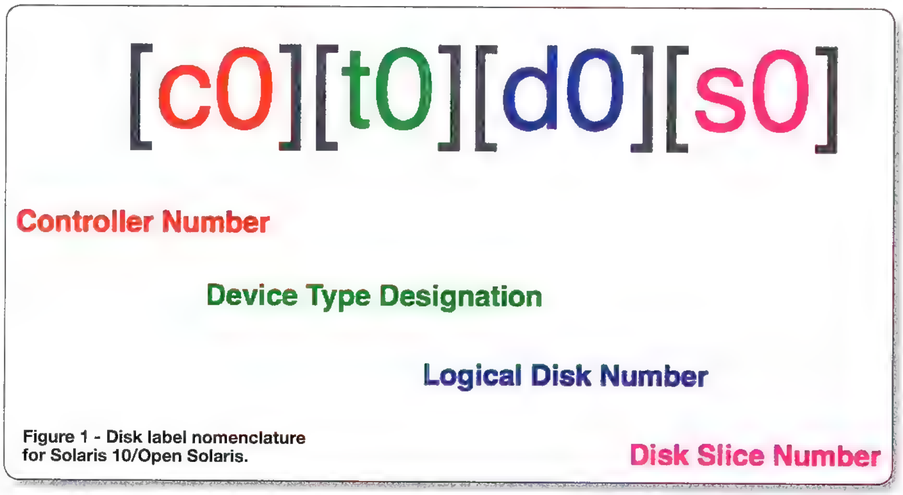


Figure 1 - Disk label nomenclature for Solaris 10/Open Solaris.

```
30512 alt 2 hd 255 sec 63>
          /pci@0,0/
pci8086,2948@1c,4/pci-ide@0/
ide@0/cmdk@0,0
       1. c1t0d0 <ATA-SAMSUNG
HD321KJ-0-10-298.09GB>
          /pci@0,0/
pci1458,b005@1f,2/disk@0,0
```

Find the ones we want to pick on! You'll remember which disk you elected to use at OS install time (ours is c0d0).

Redundancy discussion

There are various possibilities in ZFS to create redundancy on your volumes. Consider this. You've got 8TB of raw disk sitting under the hood. Would you really risk it to JBOD or RAID0? If the answer is yes, you don't belong here. ZFS offers the following options to us:

RAIDZ MIRROR (command alias: mirror)
As the name implies, exactly like RAID1, without the sadness of RAID write holes and with better throughput. You have an exact mirror of your data on both of your two drive sets.

RAIDZ1 (command alias: raidz, raidz1):
RAIDZ1 offers a similar level of redundancy in concept to RAID5. It gives us one parity split across all spindles in the pool – but affords us none of the performance problems of RAID5, nor the horrible RAID write hole scenario. You can have, at max, the loss of one drive and maintain data integrity.

RAIDZ2 (command alias: raidz2):
RAIDZ2 offers us a similar level of redundancy in concept to RAID6. It gives us two parity splits, diagonally SHA1 checksummed throughout all the drives. In this respect, it affords us greater performance than traditional RAID6 environments (closer to RAID10 or RAID0+1 in pure IOPS) but gives us all the comfy goodness of a write hole protected file system, that can lose two entire devices before a data loss scenario is considered.

Choose your weapon. We recommend RAIDZ1 in the home environment, if only because you have enough disk to have some redundancy, but not enough to go wasting a second on double parity. You want to keep as much space as possible! This being said, how valuable is your data?

Create it! As a root level user:

```
 bash-3.2# zpool create raidz1
atomicpuddle c0t0d0 c0t0d1
c0t0d2 c0t0d3 c1t0d0 c1t0d1
c1t0d2 c1t0d3
```

Done. You now have a multi terabyte ZFS protected storage pool.

```
 bash-3.2# zpool list
 NAME      SIZE   USED   AVAIL
CAP  HEALTH  ALTROOT
 atomicpuddle         44K
7.61TB   7.61TB     1%  ONLINE  -
```

File services

Our next step is to enable file services to your data store so that all your hosts (Windows, UNIX and Linux alike) can connect to it and read or write data. First, we'll set up NFS file services for your UNIX-like hosts. NFS is a sensible option for high throughput, stability oriented connections, where security isn't necessarily of the utmost concern. To set up a simple NFS share from your pool of storage you will need to modify /etc/dfs/dfstab.

Add a share to the effect of:

```
 bash-3.2# share -F nfs -
o anon=0,root=IP.ADDRESS.
OF.CLIENTS.HERE -d "Big Atomic
Share" /atomicpuddle
```

In the most simple form, this will share your entire pool mapped as root to any device that connects over NFS. Sure, not very secure, but in the realm of a protected intranet in your own home, this is perfect for dump space or a resource your media devices can access at the drop of a hat.

To enable NFS and make it share your exported ZFS filesystem:

```
 bash-3.2# svcadm enable nfs
 bash-3.2# shareall
```

For Windows hosts, we'll rely on CIFS. Configuration is a little more complicated than NFS, as the protocol needs to cater to a much wider range of situations.

```
 bash-3.2# svcadm enable -r smb/
server
 bash-3.2# zfs set sharesmb=on
atomicpuddle
```

If you'd like to name your workgroup or join a domain:

```
 bash-3.2# smbadm join -w
atomicgroup
```

You can then check that your share is working:

```
 bash-3.2# sharemgr show -vp
 ...
 ...
```

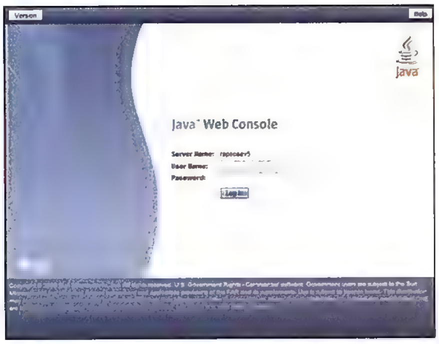


Figure 2 - The Sun Java Web Console, allowing you to perform complex tasks in a web based GUI.

```
 default nfs=()
 zfs
        zfs/atomicpuddle smb=()
              atomicpuddle=/
atomicpuddle
```

Keeping in mind, that within OpenSolaris, the CIFS protocol is implemented 'in kernel', so system resource utilisation is markedly less, with significant performance gains attainable.

Point a client at the IP address of the OpenSolaris host, and try to connect over an appropriate protocol!

Of course, Sun is trying to make things easier for us. You now have the ability to do all of this over a friendly web based GUI, known as the Java Web Console. To enable it, as root in a terminal:

```
 bash-3.2# svccfg -s svc:/
system/webconsole setprop
options/tcp_listen = true
 bash-3.2# smcwebserver restart

 Restarting Sun Java(TM) Web
Console Version 3.1 ...
 The console is running
```

Provided everything went to plan, point a web browser to **https://ip.address.of.fileserver:6789**

In here, we'll find the ZFS administration tools.

The crowning achievement

To really impress the neighbours and make your life easy, why not implement iSCSI? Vista supports it, as does Mac OS X Leopard.

Let's make a new zpool for backup purposes.

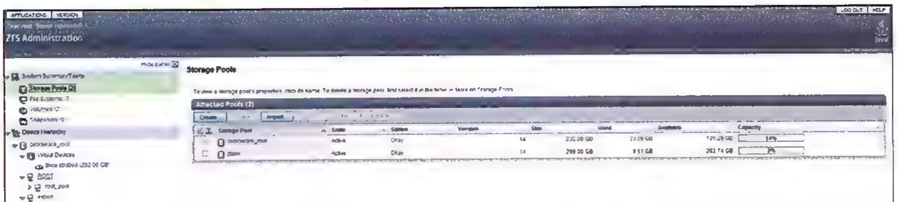
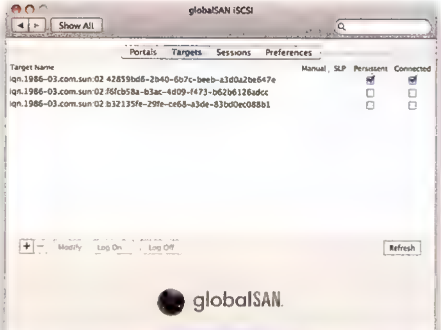


Figure 3 - The ZFS admin tools, allowing us to do all that we can from the command line, but in graphical form.



globalSAN iSCSI

Portals Targets Sessions Preferences

Target Name	Manual , SLP	Persistent	Connected
iqn.1986-03.com.sun:02 42859bd6-2b40-6b7c-beeb-a3d0a2be647e		☑	☑
iqn.1986-03.com.sun:02:f6fcb58a-b3ac-4d09-f473-b62b6126adcc		☐	☐
iqn.1986-03.com.sun:02:b32135fe-29fe-ce68-a3de-83bd0ec088b1		☐	☐

Figure 4 – GlobalSAN iSCSI Initiator for Mac OS X Leopard - an entirely free product.

It will be the holder of our iSCSI backing store. We popped another 2 * 500GB SATA modules into the case.

```
 bash-3.2# zpool create backups
c1t1d0
 bash-3.2# zpool attach backups
c1t1d0 c1t1d1
 bash-3.2# zpool status backups

 pool: backups
  state: ONLINE
  scrub: resilver completed
after 0h0m with 0 errors on Sun
Dec  7 11:35:39 2008
 config:

        NAME         STATE
READ WRITE CKSUM
        backups      ONLINE
0     0     0
          mirror     ONLINE
0     0     0
            c1t1d0   ONLINE
0     0     0  44K resilvered
            c1t1d1     ONLINE
0     0     0  70.5K resilvered
```

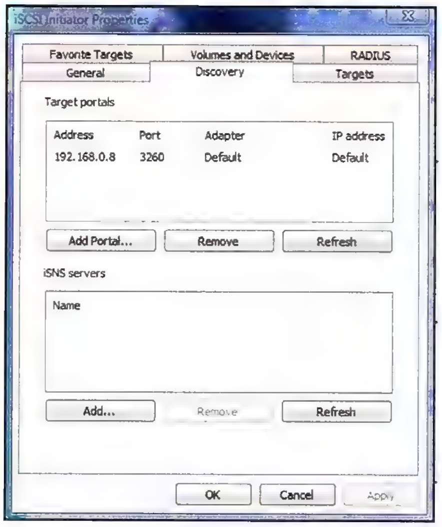
We now have a 500GB mirror protected pool to work with.

Let's make some iSCSI backing stores for it.

```
 bash-3.2# zfs create -s -V
100GB backups/atomic_osx_backup
 bash-3.2# zfs create -s -V
100GB backups/atomic_linux_
backup
 bash-3.2# zfs create -s -V
250GB backups/atomic_windows_
backup
```

Here, we've made three new iSCSI LUN's. Each with a different purpose. Time to share them out over iSCSI.

```
 bash-3.2# zfs set shareiscsi=on
backups/atomic_osx_backup
 bash-3.2# zfs set shareiscsi=on
backups/atomic_linux_backup
 bash-3.2# zfs set shareiscsi=on
```



iSCSI Initiator Properties

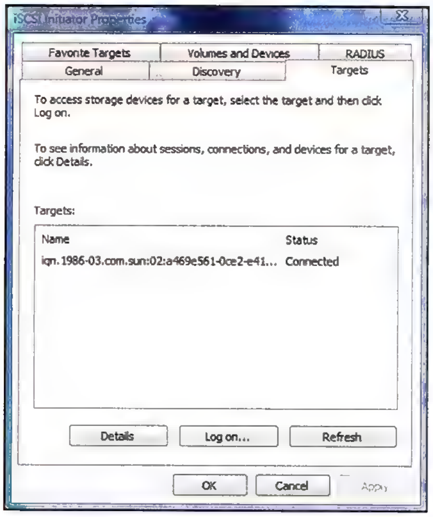
Target portals

Address	Port	Adapter	IP address
192.168.0.8	3260	Default	Default

iSNS servers

Name

Figure 5 - Simply insert the IP Address of the Solaris/OpenSolaris server, and it will find your iSCSI LUN's.



iSCSI Initiator Properties

To access storage devices for a target, select the target and then click Log on.

To see information about sessions, connections, and devices for a target, click Details.

Targets:

Name	Status
iqn.1986-03.com.sun:02:a469e561-0ce2-e41...	Connected

Figure 6 - LUNs from iSCSI are similar to WWNs (world wide names) from the Fibre Channel world.

```
b62b6126adcc
     Connections: 0
```

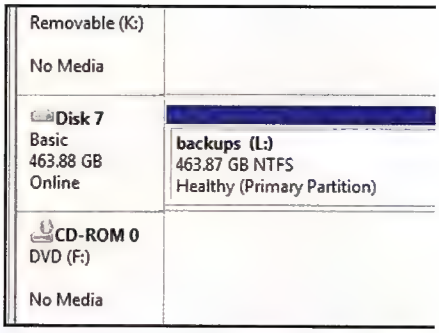
Your iSCSI LUN's are ready to present to your hosts. We suggest the use of GlobalSAN's iSCSI Initiator for Mac OS X.

For Windows, we recommend you use the built in iSCSI Initiator in Vista.

Evil file system tuning

ZFS is hiding magic inside. One such enchantment is on the fly file system compression. This enables a user to write data to the pool of storage and have it on the fly compress, as it passes through kernel. This can create dramatic space saving of storage, depending upon the nature of the data compressed. Our crash test dummy, forum hero brains, turned it on recently with the generic lzjb compression, but found setting gzip-9 to be far more effective. Your mileage may vary.

```
 bash-3.2# zfs set
compression=on gzip-9
atomicpuddle
```



Removable (K:) No Media	
Disk 7 Basic 463.88 GB Online	backups (L:) 463.87 GB NTFS Healthy (Primary Partition)
CD-ROM 0 DVD (F:) No Media	

Figure 7 - Go into Disk Management Snap-in and format/use, just like any other NTFS volume.

The power of a multithreaded file system is realised here – watch that quad core come to life. One would expect this to slow down file system reads and writes. This is a long way from the truth. Due to the nature of kernel caching, on the fly compression can actually speed up both reads and writes.

Snapshots are a function of ZFS that the world is only just coming to grips with. This allows point in time restore of erased or damaged inodes back to the metadata state of the previous snapshot. To snapshot a volume, it is ever so simple:

```
 bash-3.2# zfs snapshot
atomicpuddle.
```

The snapshot files can be accessed (or, the inode references, anyway!) under .zfs/snapshot in the root of the file system directory of the ZFS pool.

With the recent innovation of L2ARC, we can now super-charge the actual speed of your R/W via the use of SSD technology. If you are lucky enough to have a SATA connectable SSD handy, plug it in. We'll turn it into a super-fast ZFS Cache. Think of it like having something 40x faster than a 15k RPM FC-AL disk at your disposal – that passes the benefits onward to your SATA disks. It is bringing the high end concepts of tiered storage to the home environment.

To configure a ZFS raidz1 array with an SSD cache pool:

```
 bash-3.2# zpool create raidz1
atomicpuddle c0t0d0 c0t0d1
c0t0d2 c0t0d3 c1t0d0 c1t0d1
c1t0d2 c1t0d3 cache log c1t0d4
```

Where c1t0d4 is an SSD drive plugged into your SATA channels.

We've only really shown you the basics to the technology under the Solaris/ZFS bonnet. There's a myriad of tools, functions, GUIs and advanced features available to you – with more being made every week (some new upcoming functions include ADM, the automatic data migrator and on the fly block level de-duplication). It is an exciting time to be (storage) alive. **JC**

OCZ Technology

ELITE X STREAM
POWER SUPPLY

+12V SINGLE RAIL DESIGN = MAXIMUM POWER DISTRIBUTION

Powerful:
800W and 1000W configurations

Ultra Efficient:
80 PLUS CERTIFIED
80-Plus certified with a Ultra-high 84% efficiency rating for energy savings

Superior Cooling:
Ultra-quiet 120mmfan for supreme air flow

NVIDIA® SLI™-Ready:
NVIDIA SLI READY
Equipped to fuel the demands of SLI graphics systems and other multi-GPU set-ups

OCZ PREMIUM POWER SUPPLY

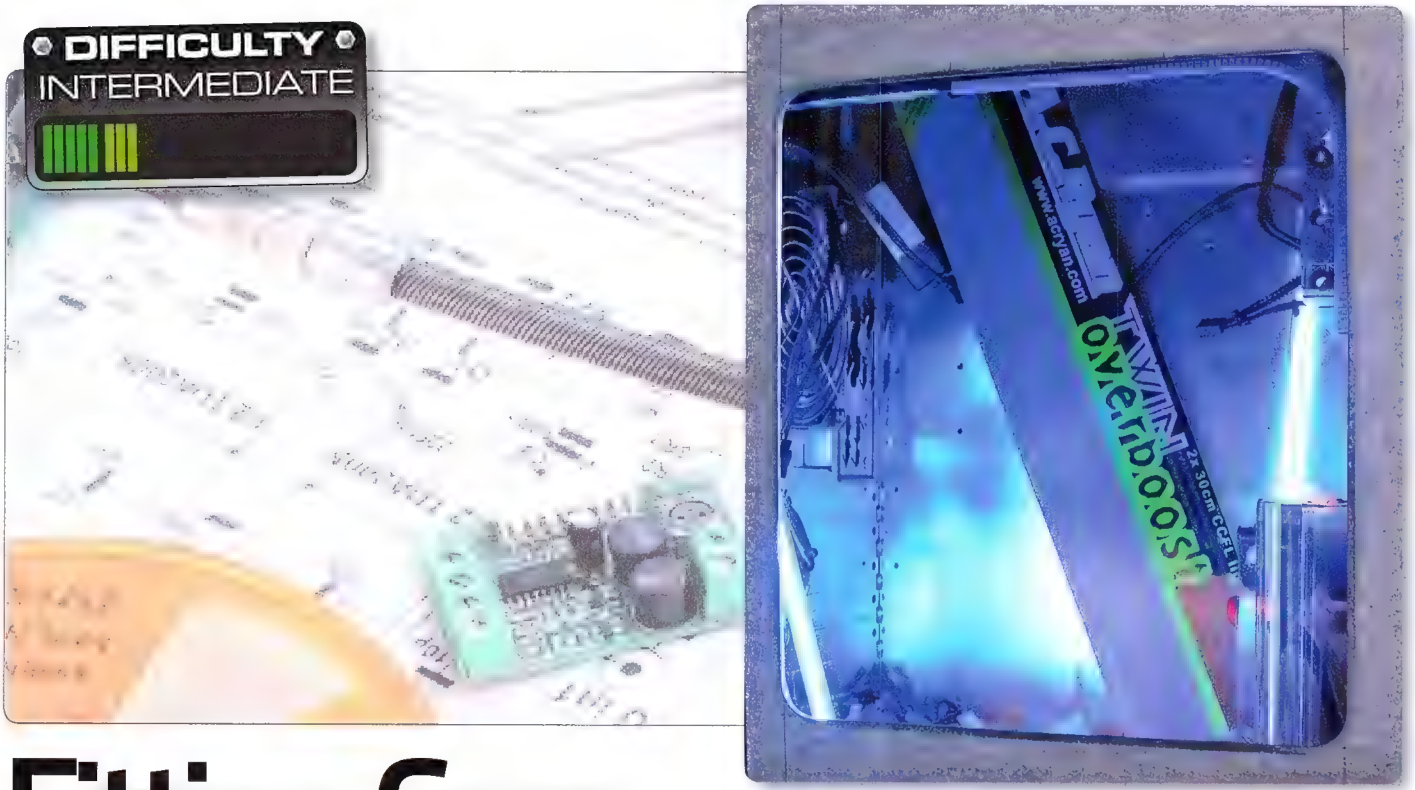
OCZ Technology
ocztechnology.com

ABT Distribution:
www.abt-computers.com.au
sales@abt-computers.com.au
Tel : 07 3808 9255

Australia IT:
Melbourne:
Sales : sales@australiait.com.au
Tel: +61 3 9560 3188

Australia IT:
Sydney:
Sales : sales@australiait.com.au
Tel: +61 2 9643 1388

DIFFICULTY
INTERMEDIATE



Fitting Case Windows: 2009 edition

Ron Prouse's shiny update to a mainstay of the modding world.

About ten years ago, when we was first beginning to dabble in the 'nouveau art noir' of case modding, we came across an internet site featuring images of a desktop PC case with a window installed in the top cover. The anecdote suggested that this aberration had been assembled by an 'eccentric' Computer Sciences professor, with the intention of displaying the 'working' internals of the average PC to his new students. If nothing else, it was a good story… but in hindsight, for me, this was an epiphany.

Up until that point my modding focus had consisted purely of increasing functionality and performance – such as cooling solutions for over-clocked Celeron 300A CPU's and the like – and I must admit that some of these examples were far from pretty in their execution. Suddenly, my focus shifted to a space where form met function, and another layer of potential was

Suppliers

PC Case Gear
http://www.pccasegear.com/
Ph 61 3 9544 7895

- 1 X Lian Li PC-A07 Case, $125.00
- 1 X AC Ryan AcrylPanel Mirror2 Panel, $35.00

Following on from our last couple of '101'-style tutorials, the next obvious progression is the humble case window.

Get all of your planning measurements right, and avoid mistakes!

Disclaimer

Whenever you pick up power tools, cutting and grinding instruments, or even a can of spray paint, you are putting your general wellbeing at risk from some form of industrial level accident. We take every precaution by wearing appropriate safety equipment, using tools with respect and within their limits, and by not inhaling the contents of glue and paint containers. We suggest that you should follow a similar regime, and seek professional assistance and guidance if you are attempting a task outside of your skill set. NB. Atomic and staff are not responsible for your safety or longevity.

Tools

The tools used in this tutorial are mainly those found in the average workshop, including a drill press and drills, jigsaw, electric sander, files and sandpaper. The main requirement is a decent bench or table, providing a solid, flat surface to operate on.

added to the way that I wanted my cases to look. I even discovered a new word: 'aesthetics'!

Back in 1999, Australia led the world in not having access to case-modding supplies, so it seemed only natural to turn on my 33.5Kbps modem and go shopping in the US. FrozenCPU (**www.frozencpu.com/**) in Henrietta, NY was a brand new site, and it could supply DIY window kits that were just the answer for the n00b that I was back then. The company didn't normally ship outside of the US, but after a dozen emails, and a money order, they relented and sent me a kit that cost about a week's wages. I think that every old skool modder in the world has used one of these kits at some time or another, and for certain mods the concept still has a lot of merit. Fitting the window was surprisingly simple; using a washer as a 'spacer' to trace a line about 3mm out from around the perimeter of the Perspex onto the case panel, and then cutting out the required hole using a jigsaw. The rubber surround was then cut to fit the inner dimensions of the hole, and the window panel squeezed into the c-channel section. Once local modders had located suppliers for the rubber moulding, it became easy to replicate the kit… and spawned a series of windows that were far removed from the original offerings.

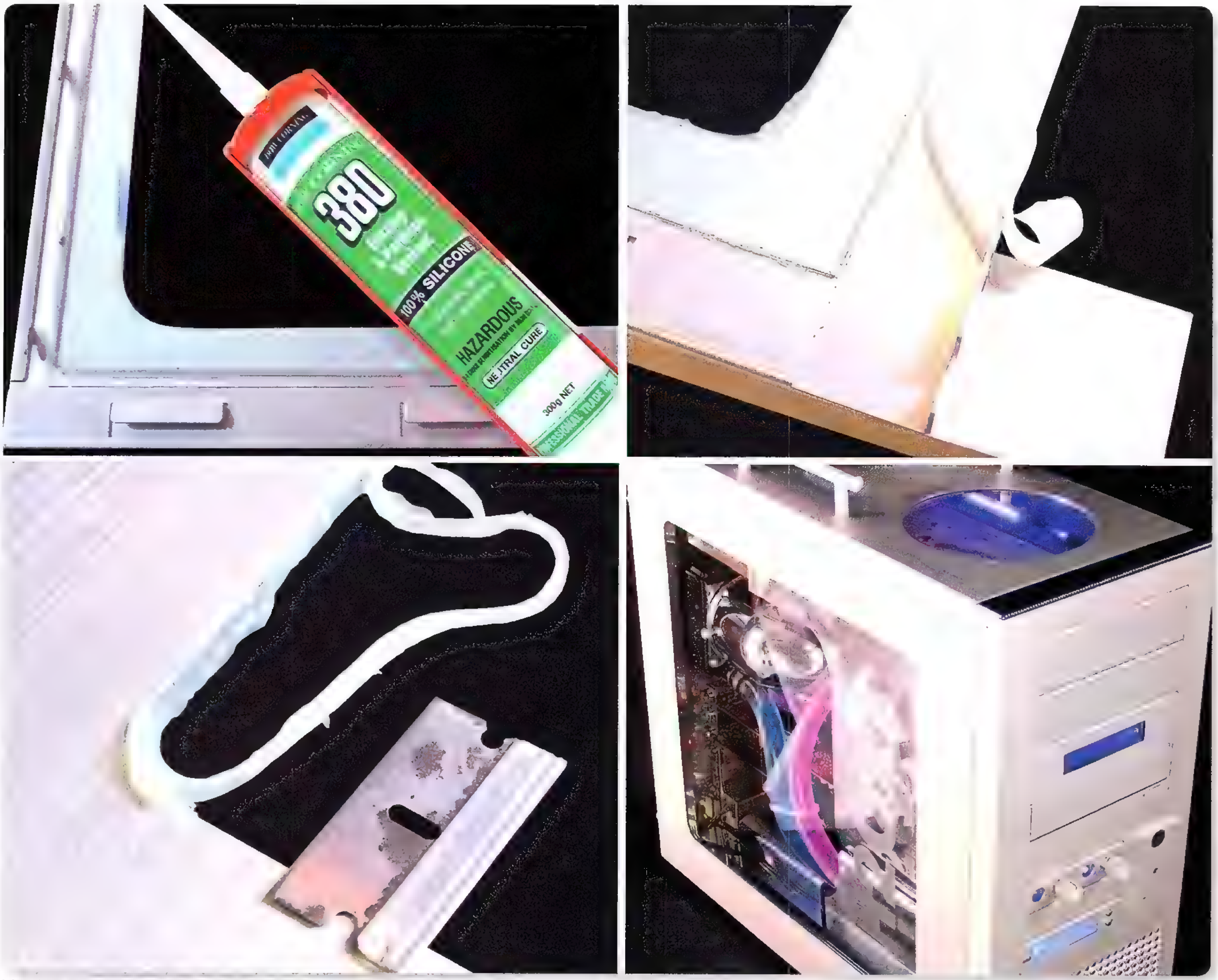
The key complaint about these types of windows was the 'bulkiness' of the rubber surround. Sure, the positive aspect was that the thickness of the profile would cover-up a potential multitude of sins that might occur during the cutting process, but it really didn't add a lot of class while doing so! This led to the emergence of some different styles, one alternative being the 'frameless' window that we'll be performing here. The frameless window is stunning from an aesthetics perspective, however it is also the most time consuming and fiddly to achieve

Regardless of the type of window that you are installing in your case, the first prerequisite is a hole; and that means a design plan. A case window can be placed just about anywhere, in any shape, but there are a few basic rules that over-rule the plethora of variables that reflect your own taste. Firstly, there needs to be enough area around the perimeter of the hole to bond the window to the case, and the rough rule of thumb is 20-30mm – depending on the type of adhesive that you are planning to use.

The second issue is to make sure that the window is not going to impinge on any case-to-case contact surfaces; e.g. any areas where the side-panels or top attach to the chassis are going to be affected if there is 2-3mm of

Use the right tools, on the right working surface, and the outcome will make you smile.

Taking your time, with an eye for detail, will ensure that your mod has that real 'Wow' factor.



The final fit-up and clean is the moment of success for the DIY modder.

Perspex or glass sandwiched between them. The aesthetics are a lot more personal, but the placement always looks better if it is 'balanced' to the proportions of the case and actually accentuates something of interest… looking through a window really requires a view beyond!

After covering the panel with masking tape to protect it from scratches, all of the dimensions were transferred over and the corners rounded to a 20mm internal radius.

Cutting the panel is fairly straightforward, however achieving the perfect final finish can be helped along a little by using the right tools. When it comes to larger cuts like these a Dremel is really out of its depth, whereas a jigsaw will give a good result in a fraction of the time.

The jigsaw blade should be fine-toothed, and a suitable style for the case material (steel, aluminium, plastic) that you're cutting. A series of pilot-holes, large enough for the blade to fit in, need to be drilled into the work-piece at points where the cuts will be started or sharp bends are going to be made.

To avoid cutting in a series of undulations, or waves, it is important to keep the guide-line and cutting edge in the same orientation all of the time. What? Simple English – either cut slightly on the inside or exactly down the centre of the line; don't alternate between the two! If you really want perfection, use a straight-edged piece of wood (clamped to the work-piece) as a guide for the jigsaw chassis to run along. Whatever method you use, take your time and be as precise as you can – and you will reduce the sanding time considerably.

Once the hole is cut out, the sanding and shaping begins. This part of the process is the most time consuming, but the time spent here will determine how good the finished item looks. It is only natural that the long side cuts will have some 'waves' in them, and getting them perfectly flat is made easier using a solid sanding block. We use varying grades of aluminium oxide abrasive paper on a 230 x 80mm block (both freely available from hardware shops) as it cuts well and is inherently tougher than 'normal' sandpaper

Getting the radii identical on all of the corners is easier if you have a sanding block with the same shape; in this case we've used a 20mm piece of electrical conduit with abrasive paper wrapped around it.

An area that seems to cause angst for many modders is the transition from the corners to the sides … getting the smooth curve to blend into the straight edge. We use an off-cut of aluminium edging that had a 'sleigh nose'-profile to even out the curve – again, time is your best ally to achieve the perfect result. On a painted case the 'raw' edge can now be painted with touch-up paint, while plastic and aluminium should be polished with a product such as 'Brasso'.

The next step is to fit the clear stuff into the hole. Depending on whether you want to use Perspex or glass (our personal favourite), there are distinctly different methods. With glass, the best solution is a glazing silicone such as the Dow Corning 380 Sealant we've used here. With the panel supported off of the bench, the area outside of where the contact area is masked off, to make clean-up easier later. A thin layer of silicone is then applied to the case panel, smoothed out as if you were fitting a

Double-sided tape has other uses apart from practical jokes – honest!

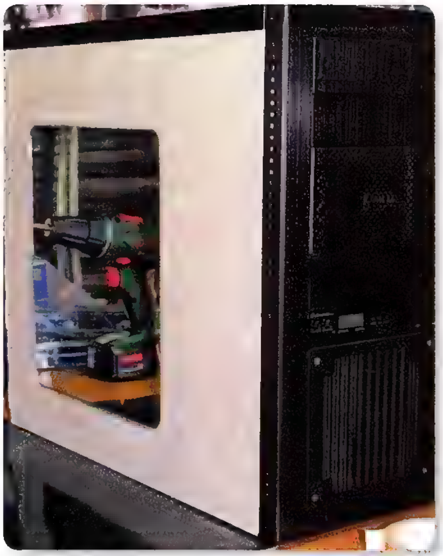
CPU heat-sink, and the glass dropped into place. Gentle pressure is applied to squeeze out any air bubbles, with the idea being to get a small bead of excess silicone around the inner edge of the panel and the glass. A reasonable weight, such as 12 Atomic back issues, is then positioned onto the centre of the glass to hold it all in place for the 12-hour curing period. Once the silicone has set, any excess is then cut away with a sharp blade, the masking tape removed and the glass cleaned off.

For fitting an acrylic panel, the process is a little simpler. We're using Norten 'Bear' brand double-sided tape, which forms an incredibly strong bond and measures less than 0.5mm thick. The tape is applied to the inside contact area of the case panel, and then trimmed back approximately 2mm from the inner edge of the hole; this will avoid dust and fluff sticking to any exposed adhesive around the edge of the window. The acrylic window is marked around the outer edge of the window hole, and the contact area lightly sanded to give something 'rough' for the tape to grip onto. Finally, with the yellow backing tape removed, the adhesive can be warmed-up slightly with a hair dryer to ensure the best possible bond, and the window pressed firmly into place.

On to the output pictures! For this mod we were using an AC Ryan AcrylPanel Mirror2 Panel, just to see what it would look like in a common modding application. According to AC Ryan, this is the, "hottest new material for high end mods" and describes it as, "a two-way mirror that is a perfect mirror as well as see through at the same time – it lets you see through from the darker side and reflects as a mirror on the brighter side". Which is a pretty accurate description. The only disappointment was the size of the panel, which is a mere 400 x 300 x 3mm thick – deduct 20mm all-round for overlap and it will only allow for a window 36 x 26cm. An additional 10cm wider would have made it much more flexible to work with. Fabricating with what was available, we decided to place the window toward the rear of our Lian Li PC-A07 case, away from the drive bays at the front of the case, focusing on the mobo area.

So, what is the overall effect like? At the left is the mirror panel as it is fitted into the case, and it certainly does what it says! The effect looked great against a black cover, but it would look even hotter in a brushed aluminium enclosure.

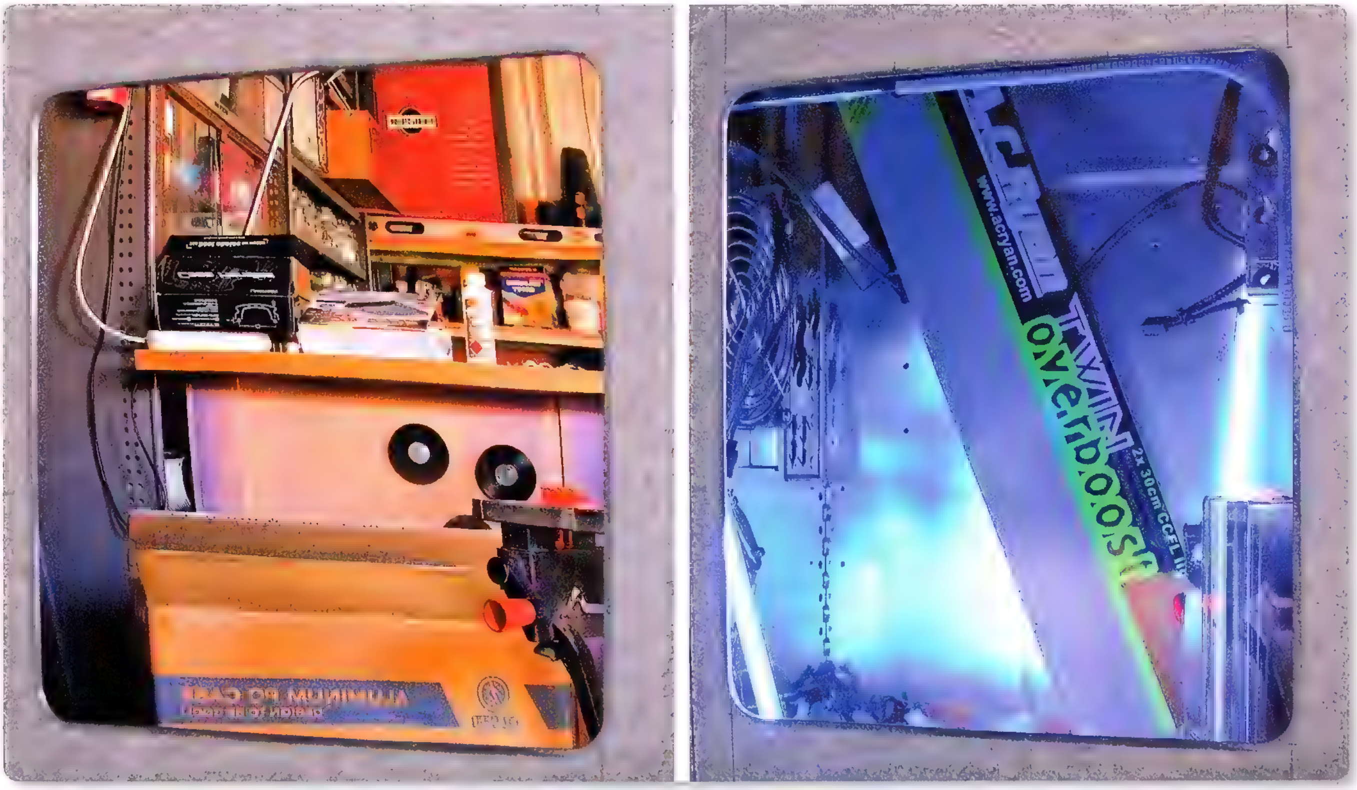
The two-way effect is just as good. With a pair of 30cm blue cathodes in the case, the chameleon effect is fantastic, and the interior of the case is easily visible. Remember that the effect is dependent on the inside of the case being brighter than the external ambient light, so it would pay to add a tad more lighting to the case to extend the effect.



The AC Ryan AcrylPanel Mirror2 Panel is a great concept… if only it was a little larger.

The down side? Hairline scratches will be an unavoidable reality if you clean the mirror panel with anything other than an incredibly soft cloth, but luckily they are not obviously apparent to the casual admiring glance.

Overall, we would have to say that the AcrylMirror2 is a winner if you are looking for a fresh approach to case windows! **RP**



The picture says it all – just add enough light and Mirror2 Panel is the win.

Studying in New South Wales

What has the Waratah State got to offer prospective IT students?

There are 14 universities with campuses in New South Wales. For the prospective information technology student who has high enough grades to pick and choose between institutes, the choice could be overwhelming. Certainly, institutes such as The University of Notre Dame, without any information technology courses, can be immediately discounted, but that still leaves many options. We can't tell you what course you should undertake nor what university is the best. That choice is yours and yours alone and may be influenced by, among other factors, worldwide and national rankings, the units that are on offer to undergraduate students and geography.

Note that not every course listed below falls neatly under the banner of information technology. Some fall into multi-disciplinary fields, combining aspects of information technology with engineering, medicine, education and the humanities.

Macquarie University

Location North Ryde
Web www.comp.mq.edu.au

Undergraduate degree programs: Bachelor of Information Systems, Bachelor of Computer Science, Bachelor of Information Technology, Bachelor of e-Business
Undergraduate double degree programs: Bachelor of Information Technology/Bachelor of Laws, Bachelor of Business Administration/Bachelor of Information Technology
Postgraduate programs: Master of Information Technology, Master of Consulting in Information Technology, Postgraduate Diploma in Information Technology, Graduate Diploma in Information Technology

University of New England

Location: Armidale
Web: www.une.edu.au

Undergraduate degree programs: Bachelor of Computer Science
Undergraduate double degree programs: Bachelor of Computer Science/Bachelor of Law, Bachelor of Information Technology/Bachelor of Teaching
Postgraduate programs: Graduate Certificate in Computer Science, Graduate Certificate in Information Technology

University of New South Wales

Location: Kensington, as well as Canberra and Singapore
Web: www.unsw.edu.au

Undergraduate degree programs: Bachelor of Commerce (Information Systems), Bachelor of Science (Business Information Technology), Bachelor of Architectural Computing, Bachelor of Digital Media, Bachelor of Engineering (Bioinformatics), Bachelor of Engineering (Computer), Bachelor of Engineering (Mechatronic), Bachelor of Engineering (Software), Bachelor of Engineering (Surveying and Spatial Information Systems), Bachelor of Engineering (Telecommunications), Bachelor of Science (Computer Science), Bachelor of Science (Physics and Computing)
Undergraduate double degree programs: Bachelor of Science (Computer Science)/Bachelor of Law, Bachelor of Engineering (Bioinformatics)/Bachelor of Arts, Bachelor of Engineering (Bioinformatics)/Bachelor of Science, Bachelor of Engineering (Mechatronic/Biomedical Engineering), Bachelor of Science (Computer Science)/Bachelor of Arts, Bachelor of Science (Computer Science)/Bachelor of Digital Media, Bachelor of Engineering (Software Engineering/Biomedical Engineering), Bachelor of Engineering (Telecommunications/Biomedical Engineering)

Postgraduate programs: Masters of Information Technology, Masters of Computing and Information Technology, Graduate Diploma in Computing and Information Technology, Maters of Computer Science and Engineering, Masters of Computer Science

Notes: One of Australia's most highly regarded universities, it certainly has a huge array of courses to choose from. A member of both the Group of Eight and Universitas 21. Those looking at a career in the defence force might be interested to know that the University of New South Wales is affiliated with the Australian Defence Force Academy.

University of Newcastle

Location: Newcastle (City Precinct and Callaghan), Ourimbah and Port Macquarie, as well as Singapore
Web: www.newcastle.edu.au

Undergraduate degree programs: Bachelor of Computer Science, Bachelor of Engineering (Computer), Bachelor of Engineering (Software), Bachelor of Information Technology
Undergraduate double degree programs: Bachelor of Engineering (Computer)/Bachelor of Computer Science, Bachelor of Mathematics/ Bachelor of Computer Science, Bachelor of Engineering (Computer)/Bachelor of Mathematics, Bachelor of Engineering (Computer), Bachelor of Science (Physics),
Postgraduate programs: Master of Information Technology, Graduate Diploma in Information Technology, Master of Advanced Information Technology, Graduate Certificate in Information Technology, Master of Business Administration/ Master of Information Technology

Southern Cross University

Location: Coffs Harbour (Lismore and Gold Coast campuses have no information technology offerings)
Web: www.scu.edu.au

Undergraduate degree programs: Bachelor of Information Technology, Bachelor of Applied Computing, Associate Degree of Information Technology
Postgraduate programs: Graduate Diploma in Information Technology

University of Sydney

Location: Sydney
Web: www.usyd.edu.au

Undergraduate degree programs: Bachelor of Engineering (Computer), Bachelor of Engineering (Software), Bachelor of Engineering (Telecommunications), Bachelor of Information Technology, Bachelor of Computer Science and Technology, Bachelor of Computer Science and Technology (Advanced), Bachelor of Computer Science, Bachelor of Computational Science, Bachelor of Science and Technology, Bachelor of Information Systems
Undergraduate double degree programs: Bachelor of Information Technology/Bachelor of Arts, Bachelor of Information Technology/Bachelor of Medical Science, Bachelor of Information Technology/Bachelor of Science, Bachelor of Information Technology/Bachelor of Commerce
Postgraduate programs: Graduate Certificate in Project Management, Graduate Ceritficate in Information Technology, Graduate Diploma in Information Technology, Graduate Diploma in Computing, Graduate Diploma in Information Technology Management, Graduate Diploma in Project Management, Graduate Diploma in Telecommunications, Master of Project Management, Master of Engineering (Network Engineering), Master of Engineering

which
ict career
suits you?

SWIN
BUR
NE
SWINBURNE UNIVERSITY OF TECHNOLOGY

Business and technical ICT degrees at Swinburne

Swinburne offers students a wide range of business and technical ICT degrees that prepare students for a variety of challenging and creative careers.

Swinburne provides a range of courses in:
- **Business Information Systems**
- **Computing**
- **Information Technology – Scholarship Program**
- **Network Design & Security**
- **Professional Software Development**
- **Telecommunication & Network Engineering**

Swinburne's ICT courses provide students with the technical skills, knowledge and business focus to work in the most exciting areas in ICT. You can take an Industry-Based Learning (IBL) placement for 6 or 12 months to combine your degree with practical paid work experience. Each year, Swinburne places ICT students at leading organisations including National Australia Bank, SEEK, IBM and Fosters.

Lead the way in technology with an ICT degree at Swinburne.

Call 1300 ASK SWIN or visit www.swinburne.edu.au/ict

CRICOS Provider Code. 00111D (VTAC Code: 34001)

2008 Swinburne Centenary

(Wireless Engineering), Master of Information Technology, Master of Information Technology Management, Master of Infromation Technology/Master of Information Technology Management, Graduate Diploma in Computing/Master of Information Technology, Graduate Diploma in Computing/Master of Information Technology Management

Notes: Another highly regarded university. The University of Sydney is a member of the Group of Eight, Academic Consortium 21, the Association of Pacific Rim Universities and the Worldwide Universities Network. A good selection of post-graduate courses, ranging from graduate certificates to masters degrees.

University of Technology, Sydney

Location: Sydney
Web: www.uts.edu.au

Undergraduate degree programs: Bachelor of Information Technology, Bachelor of Science in Information Technology, Bachelor of Science in Games Development

Undergraduate double degree programs: Bachelor of Business/Bachelor of Science in Information Technology, Bachelor of Science in Information Technology/Bachelor of Arts in International Studies, Bachelor of Science in Information Technology/Bachelor of Laws, Bachelor of Mathematics and Computing

Postgraduate programs: Master of Software Engineering Management, Graduate Certificate in Information Technology Management, Graduate Diploma in Information Technology Management, Master of Business Information Technology Management, Graduate Certificate in Strategic IT Leadership, Graduate Certificate in Information Technology Project Management, Graduate Certificate in Internetworking, Graduate Diploma in Internetworking, Master of Science in Internetworking, Graduate Certificate in Interactive Multimedia, Graduate Diploma in Interactive Multimedia, Master of Interactive Multimedia, Graduate Certificate in Information Technology, Graduate Diploma in Information Technology Master of Information Technology

Notes: The IT faculty offers a Diploma of Information Technology Professional Practice. It's not a standalone, undergraduate course, nor is it graduate-entry—it is essentially an industry placement program undertaken at the same time as your undergraduate degree.

Charles Sturt University

Location: Wagga Wagga
Web: www.csu.edu.au

Undergraduate degree programs: Bachelor of Applied Science (Library and Information Management), Bachelor of Computer Science, Bachelor of Computer Science (Games Development), Bachelor of Education (Technology and Applied Studies), Bachelor of Industry Computing, Bachelor of Information Technology, Bachelor of Information Technology (Business Services)

Undergraduate double degree programs: Bachelor of Business/Bachelor of Information Technology, Bachelor of Science/Bachelor of Information Technology

Postgraduate programs: Graduate Certificate in Applied Science (Library Science/Information Management), Graduate Certificate in E-Commerce, Graduate Certificate in Information Systems Security, Master of Information Systems Security, Graduate Certificate in Information Technology, Graduate Certificate of Information and Communication Technology Education, Graduate Diploma if Information and Communication Technology Education, Graduate Certificate in Management (IT), Master of Management (IT), Graduate Diploma of Information Technology, Masters of Information Technology, Master of Computational Modelling, Master of Information Architecture, Graduate Certificate in Information Systems Security, Master of Information Systems Security,

Curtin University

Location: Sydney
Web: www.curtin.edu.au

Undergraduate degree programs: Business Information Systems

Notes: Only one 'information technology' course offered outside of Curtin's WA campuses.

University of Western Sydney

Location: Parramatta, Penrith, Campbelltown
Web: www.uws.edu.au

Undergraduate degree program: Bachelor of Computing, Bachelor of Computer Science, Bachelor of Design and Technology, Bachelor of Engineering (Computer), Bachelor of Information and Communications Technology

Postgraduate programs: Graduate Diploma Professional Computing, Master of Information and Communications Technology

University of Wollongong

Location: Wollongong
Web: www.uow.edu.au

Undergraduate degree programs: Bachelor of Engineering (Computer), Bachelor of Engineering (Telecommunications), Bachelor of Computer Science, Bachelor of Information Systems, Bachelor of Information Technology, Bachelor of Internet Science and Technology

Undergraduate double degree programs: Bachelor of Computer Science/Bachelor of Science, Bachelor of Creative Arts/Bachelor of Computer Science, Bachelor of Mathematics/Bachelor of Computer Science, Bachelor of Engineering/Bachelor of Computer Science, Bachelor of Computer Science/Bachelor of Law

Postgraduate programs: Graduate Diploma in Computer Science, Master of Computer Science, Master of Computer Studies, Graduate Diploma in Internet Technology, Master of Health Informatics, Master of Industry-Based Information Technology, Master of Information and Communication Technology, Master of Information Systems, Graduate Certificate in Information Systems, Graduate Diploma in Information Systems and Technology

Australian Catholic University

Location: North Sydney
Web: www.acu.edu.au

Undergraduate degree program: Bachelor of Business Information Systems

Notes: Only one 'information technology' course is offered at the Sydney campus of Australian Catholic University.

Geek-degrees of separation

Despite the rumoured social reclusiveness of geeks, geek superstars are easy to meet, but they're not always very social...

So it turns out that one of my oldest friends does tech support for Mr. XKCD himself, Randall Munroe. Quite why he didn't think I would want to know this sooner is beyond me. The way to become Randall Munroe's tech support dude is to hang out on the right IRC channels; there's something to be said for old skool.

I know this fact only because I thought I'd do my Geekette this month in a slightly humourous vein, as "Everything in life I need to know I learned from XKCD". After reading just the first 16 comics, I already had on my list such things as: 'always check mouseovers' and 'after reading too much Slashdot and BoingBoing, it pays to go outside and sit under a tree' and 'don't quote ten minutes of Holy Grail, even among friends'.

Friendship often develops into something more, at least among geeks.

That last commandment segues nicely into The Short Bus of Social Interactivity (**http://jorm.livejournal.com/94477.html**) which details the things that you really shouldn't do if you don't want to appear socially backward. It makes a nice paired reading (**http://www.steelypips.org/paired/**) with the Geek Social Fallacies (**http://www.plausiblydeniable.com/opinion/gsf.html**) as required reading for young geeks.

The Geek Social Fallacies include Fallacy #1, Ostracisers are Evil, which "prevents its carrier from participating in – or tolerating – the exclusion of anyone from anything, be it a party, a comic book store, or a web forum, and no matter how obnoxious, offensive, or aromatic the prospective excludee may be." I know I suffered from this for many years, leading to some unfortunate incidents because I didn't know how to say "no" forcefully enough to twerps.

Which leads me back to Nice Guy syndrome (**http://en.wikipedia.org/wiki/Nice_guy**) and a recent XKCD comic (**http://xkcd.com/513/**). Many otherwise lovely geeks of my acquaintance have the impression that if they hang around with the object of their affection long enough, said object will eventually realise and fall into their arms with joy and hot sex.

XKCD nicely skewers this, illustrating that really, it's better to just be a friend. Friendship often develops into something more, at least among geeks, but entering into friendship under the impression that it will be something more, without actually ever asking for more, is just kinda creepy. It can be hard when you see the person of your dreams repeatedly hooking up with partners who you don't consider good enough for them, but it's hard to rectify that if you never say: "So, wanna be my arm-candy?"

Anyway, so I was trying to cut short 500 XKCD comics by asking my friend if he had any wise things he'd learned from XKCD. And he said he could ask Randall, because they hang out together on IRC. At which point, constant reader, I wibbled a bit.

I should be down with the whole geek degrees of separation thing by now. I'm a bit of a science fiction nerd, and I've run into Eric Raymond and Cory Doctorow at conventions, as well as Neil Gaiman (he's shorter than he looks) and Charlie Stross. (If you want to run into them too, your best bet is go to the Melbourne Science Fiction Worldcon in 2010: **www.worldcon.org**)

I have to also tell you, however, that some of those exceedingly high level geeks could also do with reading the Geek Social Fallacies and The Short Bus of Social Interactivity. I won't mention which of the above folks spent twenty minutes telling me about his gaming campaign, with bonus Paladin, and which one spent twenty minutes talking at me vehemently (and inaccurately) about a topic I studied for my PhD.

My point? Well I don't really have one.

I did want to prove a point about how easy it is to meet geek superstars, compared to regular stars, but nobody I asked had any connection with ubergeeks except me and my friend the Tech Support Dude. Maybe they don't hang out on IRC enough.

I could investigate the probability that you'll have read one of the above links in the last months, thus proving that we all move in the same circles and geekdom is a tiny subculture, and you're bound to know someone I know, at least tangentially, but really? That's the internet for you.

I never did find out what Randall learned from XKCD, though.

Zara Baxter has been friends with XKCD-tech-support-dude for 12 years in the hopes he'd eventually see how perfect they are for each other. Not.
zbaxter@pcauthority.com.au

IF A FRIEND TELLS YOU LIFE SUCKS

TELL THEM WHERE TO GO

reachout.com.au

Log on if life could be better

GAMEPLAY

GAMES, GAMING AND FILM COVERED... ATOMIC-STYLE

Make ready! Present arms! FIRE!

Yes, we've been playing an awful lot of Empire: Total War, and we've got a full preview of the game to show for it - we're simply beside ourselves in anticipation of the final release!

But this issue isn't all frock coats and muskets – we also take a look at pro-gaming, with embedded gaming reporter Seamus Byrne stowing himself away to report on the World Cyber Games in Europe. What's it like to be on the road with some of the best gamers in the world? Find out in this month's Engine Room.

Plus, we've got our usual array of top flight reviews.

Probably at the forefront of our thoughts this month is GTA IV on PC. We boldly gave it a ten of out ten for our console review, but it's a very different story this time around. If you've been waiting for the PC version, you really should catch up on all the issues plaguing the game. We look at Mirror's Edge, a new take on jumping puzzles, and we take a gander at the latest in the Tomb Raider franchise. Is Lara starting to look her age? We'll let you know.

Meanwhile... back to playing Empire. Charge!

GAMEPLAY CONTENTS

Engine Room: 84
Diplomatic Immunity
Seamus Byrne goes on the road with Australia's best gamers at the World Cyber Games.

Preview: Empire: Total War 88

GTA IV PC edition 92

Tomb Raider: Underworld 94

Mirror's Edge 95

Culture Shock 96
Geeky happenings, from the new Star Trek movie, Star Wars at the Powerhouse Museum, and the latest Anime releases.

Diplomatic Immunity

Australia's Team Immunity were looking to kick ass and take names at this year's World Cyber Games. Atomic rode shotgun to find out if pro gamers are getting the rockstar treatment.

See, I TOLD you all this gaming wasn't a waste of time!”

Isn't that what many dream of telling their parents? That we are now raking in the dough like we're living in some kind of pay per frag sponsorship program? Well, that day is here for many serious gamers playing on the international stage, but for the Aussie elites it's still early days in the money stakes. But while there's not a lot of money being made locally as a gamer for hire, there is some free globetrotting up for grabs to compete with the best in places like Paris, Stockholm, or Singapore; in the case of Team Immunity at World Cyber Games 2008, it's Cologne, Germany.

For some of the team it's their first trip anywhere in the world, making the quote above a sure thing as family farewells are conducted at the airport. Atomic was along for the ride to Germany with Immunity's Counter-Strike 1.6 team to see the world of pro gaming up close and personal. Call it embedded reporting for the geek set. Yes, somebody has to do it, and better a CS virtual warzone than something more serious. We'll leave the hard work to real foreign correspondents.

Eye of the Tiger

Immunity flew into Frankfurt, then hopped a train to Cologne, and – showing their commitment to the cause – they had no intention of crawling off to their hotel for a nap like any sane human after a long haul to Europe. Having arrived a week early in Cologne, the team dumped their gear and headed straight into bootcamp, having secured a great opportunity to train with one of the best teams in the world, SK Gaming.

SK is one of the world's premier pro gaming organisations, covering the gamut of core pro gaming titles. Their Counter-Strike 1.6 team hails from Sweden and was warm favourites to take out the title. SK is a superstar team on the world stage, signing autographs and earning a very comfortable living winning giant novelty-sized cheques. In fact the walls of the SK offices are practically wallpapered in these cheques, and we spotted more tucked behind the furniture — there's only so much wall space for showing off your winnings!

Immunity hit the SK offices for a week of morning-to-midnight training sessions, and within days the boys were starting to see their game improve in the face of first class competition.

The gaming servers in Europe were stunning to see in action. With a real international pro scene, Immunity was granted access to a private server network to train against the best from right across the continent. When a match is organised through this network a private server will be raised at a location in a third country, when necessary, to ensure fair latency between the two competing teams. A very different world from the laggy garbage we all take for granted back home.

The team really showed they were not just here for a holiday, putting in a big effort to show the world they had real talent to bring to the table. Over the week their confidence grew, and when they started taking regular matches against some fancied competition, the team started to entertain thoughts of scoring some upset wins at the Games.

... word quickly spread that the Australian team were not the pushovers people were expecting.

But it wasn't all skittles and no beer. Two nights before the tournament kicked off, the boys headed out for some 'team bonding' and went very hard on the tiles of Cologne's cobbled town streets. More than one actually managed to make it home before daylight. Funnily enough, it wasn't the drink but a very dodgy Subway roll that caused a very big mess in the SK Gaming bathroom as Gaz copped a bout of food poisoning. Let's call it his faux rockstar moment, as a sink had to be dismantled and cleaned because it was plugged full of sick. Good thing Gaz is a plumber by trade, so he got in and did the job himself. But that's negative rockstar points for fixing what you broke.

Showtime

Crunch time arrived in a flash, and like all the best Australian sporting encounters Immunity would face Dignitas, the British team, first up. Pound for pound, this was a match-up akin to the Socceroos taking on the England in the football.

The Aussies weren't being shown much respect from the referees during setup, either. While the Brits were cruising during map practice before the start time, we were dealing with seating changes, log-in issues, and wonky tables. Once in the server, Immunity did get some extra time to warm up but were still a good 20 minutes behind Dignitas.

But none of that would matter. With the match underway, Immunity shot out of the gate and took the opening round, and with that leapt into the air, screamed, pointed, and offered a keen lesson for our cricketers in what some classic celebratory sledging looks like. It was all over in a flash, before the team resumed their seats for round two, but an official warning landed on the team for 'unsportsmanlike conduct'. From a spectator's viewpoint, this was a team that looked like they were fired up and enjoying their game while the rest of the room sat all too quietly in their seats. Very quickly, the Aussies had a crowd gathering as people came to see what all the excitement was about.

And Immunity rolled on, taking the first half comfortably and getting out to a good lead in the second. While Dignitas fought back hard toward the closing round, the Aussies managed to take the match 17-13 for a very big upset victory. All this with that crowd of random spectators; word quickly spread that the Australian team were not the pushovers people were expecting.

They were gaming so hard and fast, that some of them were even blurry!

The boys didn't have long to enjoy the win, with the group stage playing out in quick succession. Immunity made light work of the competition from Greece and Portugal before facing up to the group favourites from Norway. Outgunned, Immunity lost their first match and with one to play a weird three-way tie for the group lead loomed if Dignitas were to beat Norway in the final round.

Some analysis of the rules and a tie would mean a 'goals scored' style count-back of the rounds won during the stage. Going into the final match against Georgia on Immunity's favourite map, Inferno, the maths showed we were behind on the count and had to dominate the match to have the best chance in a tied group. Showing impressive focus and determination, Immunity totally schooled the Georgians to take the match 30-0!

As if according to script, Dignitas beat Norway and the count was on. With their destruction of the Georgians, Immunity pushed past the Brits and qualified second from the group. A glorious moment, the boys took pride in sending the Brits home in a most undignified manner. Making the win even sweeter, Dignitas played the role of stereotypical whinging Poms and made an official complaint — because they didn't like how the count back rules were written! Our boys were thrilled to see them leave the arena like crying babies.

It's a knockout!

A rest day came and went much as the pre-tournament, with another extended training session and some analysis of their knockout stage competition, GamePlay of Finland. The Fins had won their share of tournaments, but as ever Immunity took their underdog status as an opportunity to come up with a surprise win.

It seemed word was spreading online and off that the Aussies were well worth a look, and as the match began they did not disappoint.

Back at the tournament and ready for action, an impressive crowd was gathering near the Immunity camp. It seemed word was spreading online and off that the Aussies were well worth a look, and as the match began they did not disappoint.

In a best-of-three-maps showdown, Immunity again showed their raw talent by winning the opening round and then taking the fight quickly to the Finns and never letting up. The whole team was on fire, but BenoR, the Australian star-player granted Chuck Norris status in many online discussions, truly brought his A game and pulled off some massive clutch kills to seal a win on the first map. Looking over to the Fins, there were signs of genuine disbelief, and then they stormed from the arena to regroup.

On return, the Fins threw insults at the Aussies through in-game chat, like sore losers, accusing BenoR of using hacks. But they really did regroup, taking the next map comfortably before they closed out the win in the third.

The team took the loss hard, having shown enough quality to see a few 'what if' moments in the match that could have turned the tide in their favour. The gathered crowd began

Booth babes – what gathering of gamers isn't improved with their presence?

to disperse, but many showed warm smiles and a sense of regret that these entertaining Australians were out of the tournament.

A word for our sponsors...

Now out of the tournament, the team hit the town and drowned their sorrows at the bottom of many glasses of Kölsch (the native beer of Cologne — try it when you get a chance). But there were also some last sponsor duties to be performed, with special photos and video to be put together for their major sponsors, Intel.

The boys missed their original curtain call by some two hours, but once on the scene they shook off the remnants of a big night out and fought off the growing winter chill to put in a good show.

And with that the event was a wrap. At the outset, the unfancied Australians were only expected to come along, enjoy the trip and make up the numbers. By the end, the pro gaming scene had taken notice of this fun, brash, and confident crew. For the best in the world to feel their ranks were the better for having Team Immunity amongst them should be seen as a great result for Australian gaming in general. They came to play, and the world took notice.

What more could an underdog ask for? SB

4 reasons to choose Monash

Do you dream of an exciting career in IT, but don't know how to get there?

- Monash University's IT courses cover all IT fields, for both undergraduate and postgraduate study
- Courses are flexible and can be adapted to your needs
- Undergraduate degrees all have Industry-Based Learning (IBL) programs*
- Postgraduate degrees have been streamlined to make your choice easier, whether entering the IT profession, enhancing your existing IT skills, or fast-tracking to senior management.

Want to know more?
Visit **www.infotech.monash.edu**

*IBL programs currently offered to selected Australian and New Zealand residents and include generous scholarships.

CRICOS Provider: Monash University 00008C

MONASH University
Information Technology

Empire: Total War

[PREVIEW]

Flash in the pan or worth saluting? Atomic finds out.

The Total War series stands alone for its combination of intense battlefield tactics and immense strategic overview. In the last game of the series, you could switch between choosing which gate of a medieval stronghold to assault one minute, to receiving reports on the mathematical advances being made in the Muslim world while you deliberated over what faith your people should take up.

All in glorious 3D, with thousands of soldiers on each field, and all of Europe laid out before you.

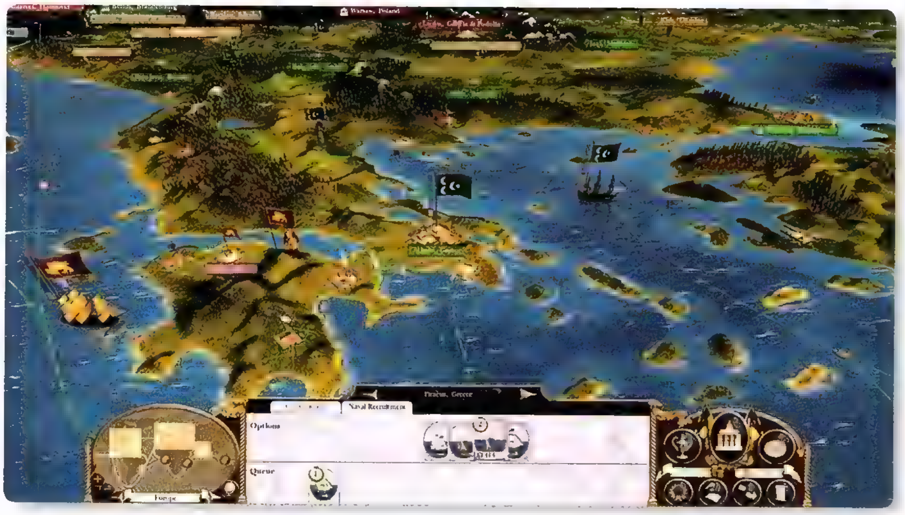
In the latest, Empire: Total War, the scope has – if anything – widened even further, and the gameplay has been refined an even further step. It's early days yet, but we're very excited by what might be the very best game in the series, and the ultimate simulation of blackpowder war and diplomacy.

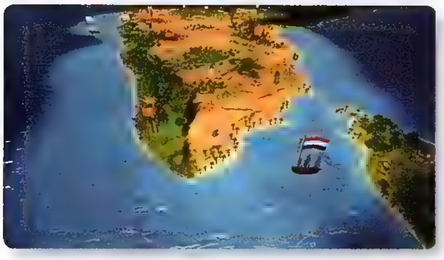
We the people...

In some ways, we're very lucky that the preview code we've had access to is limited. All we've been able to explore is 20 turns of the third chapter of the Road to Independence campaign, along with a single naval battle. This is a good thing, because otherwise we'd not be writing this review now, but rather still trying to come up with a way for the British Empire to keep a hold of the Americas.

Empire's scope, as we've alluded, is huge. The game starts with players able to control one of ten factions, but about 40 more will be unlocked as you progress. These factions are also fighting over much more than Europe – three entire theatres are included in the campaign (Europe, the Americas and the Indies), and as the game progresses and new models of society and its rule are developed (like democracy) your provinces may very well decide to go alone. For instance, in the Grand Campaign, if Britain cannot control the fledgling United States, then it doesn't merely become a rebel province – as in previous titles – but an entire new nation.

The game also features a new story-based





campaign – the aforementioned Road to Independence. This traces the efforts of Britain to keep hold of her interests in America, and is more focused on the historical highlights and personalities of the conflict.

Chapter three sees you commanding the Americans at Bunker Hill, one of the hallowed names of American Military history. As a battle to control, it's not just hallowed, it's harrowing – you start out almost surrounded, under artillery fire, and with ranks of redcoats marching at you. It's about as perfect and introduction to the game as you can get, too, and it showed off a lot of the changes The Creative Assembly have brought to the table.

In previous games you could end up with lots of different unit types in an army, but warfare in the 18th and 19th centuries is a very different affair. An average army in Empires will be made up largely of Line Infantry – soldiers with muskets, basically. In our Bunker Hill fight, we also had some local militia, some cavalry and artillery, but most units were identical. Those without an historical bent might find that limiting, but it's an accurate reflection of the period, and we're glad that CA didn't try and finesse a fancier, less satisfying solution.

A whiff of grapeshot

The mechanics of the game are instantly familiar to any Total War veteran, but the execution of manoeuvre and tactics is of course very different. The vast majority of troops are ranged, for one thing, and there's no sight more stirring than a whole brigade of units blazing away with musketry.

Artillery, too, is different, as it's all a lot more mobile – most cannons are pulled by teams of horses, so it's quite possible to limber your guns and withdraw from one position to another. Cavalry is much the same, though the new Dragoon unit is a bit more complex – they're essentially mounted infantry, so must be used with care.

It might sound as though the lack of unit variety is a strike against the game, but armchair generals need to consider that each infantry regiment can also fit bayonets, turning from a ranged unit to a melee one. Of course, there's a trade-off – plug bayonets cannot be removed once fitted, for instance, so you'll need to time your bayonet charges very well.

Unit changes aside, land combat is much the same. Some finesse has been added to

unit control, such as the ability to march your men forward a single step with a button click, or to adjust unit width by a single file or rank in a similar manner. Given the far more disciplined nature of blackpowder warfare, this is very much in keeping with historical fact. Walls and fences are also very important, and units can now take shelter behind them – handy if you're receiving a lot of cannon fire, or need to hold a position against advancing infantry. All told, Empire recreates the period with the same aplomb and attention to detail that you'd expect from any Total War game.

The USS Constitution

Your exclusive Empire unit, from Sega and Atomic

If you haven't already noticed, this is a very special Empire edition of Atomic. If you're a fan of the game (and if you're reading this, you likely are) then you need to check out the exclusive offer on page 4 and 5 of this very magazine. By taking advantage, you'll get your very own special unit – the 44 gun frigate USS Constitution.

Old Ironsides, as she became known, fought with the US navy through a number of theatres and conflicts, but served most notably during the War of 1812, against the British – she sunk or captured numerous merchant ships and the HMS Guerriere, HMS Java, HMS Pictou, HMS Cyane and HMS Levant.

The strategic game has also seen a lot of love. Provinces now not only have a capitol, but also outlying ports, villages and settlements. This mean you can disrupt the enemy without conducting a full scale invasion. Gone too are the traditional priests and spies. Instead, you can take advantage Gentlemen (who can be scientists improving tech tree research, diplomats or duelists) and Rakes (ne'er-do-wells that lie, steal and kill). It's all healthy fun!

But the biggest change on the battlefield has been reserved for naval actions.

Kiss me, Hardy

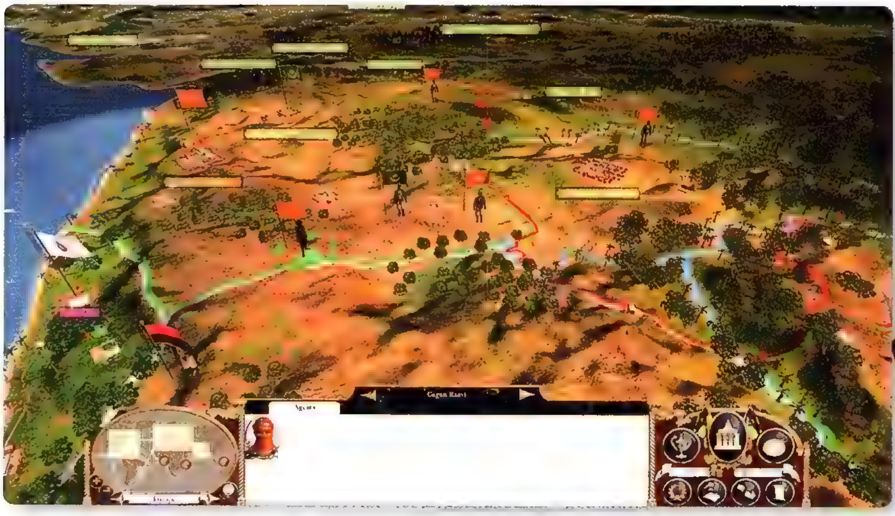
In every previous Total War title, fighting at sea was little more than the choice to fight or run away. The actual fight was worked out off-screen and all you had to choose was the level of risk.

In Empire, war on the high seas is practically a game in and of itself. This is the period, after all, that gave us some of the greatest naval engagements of all time: Trafalgar, Cape St Vincent and more besides.

Once battle is joined you get to see your fleet, much the same way you see your army on land. You set up formations, choose how much sail your lads will lay on and then get down to it. In fact, if you've ever played any stand alone Age of Sail games, this part of Empire will seem very similar. Wind direction is everything as you plot your fleet actions, and you'll want to trim the sails or load up different forms of cannon shot as the battle changes around you. Want to sail close and board? Then you'll open with chain shot to cripple the enemy's sails, then sweep the decks with few volleys of grape to get the odds in your favour.

Engagements can feature up to 20 ships on each side, but even with just small engagements – say, between one or two ships – the action is furious. Rigging crashes to the deck, splinters fly and colours are struck. There are entire games dedicated to Age of Sail warfare that don't do the action as elegantly as Empire. Given that in some engagements you could very well be engaging (or defending) transports with entire armies embarked, mastering the seas will be the key to long term success.

So, we can't wait to choose our usual Medieval: TW nation – England – and see how Britannia fares. If Atomic starts going on sale late around the time the game comes out, you'll know why. **DH**



ANTICIPATION RATING

Developer The Creative Assembly
Publisher Sega
Website www.sega.com/empire/

✓ Sprawling strategic game; intricate historical detail; superb unit control.

✗ Unsure how the three theatres will play out.

Overall
We stand at salute to the quality of this game – roll on the full version. Huzzah!

96%

Shuttle®
www.shuttle.com

Prima
XPC

SP45H7

Accelerate Your Gaming Power

The Shuttle Prima SP45H7 provides true value delivered with the latest Intel P45 chipset technology and Shuttle's new H7 chassis. Designed to provide quality and flexibility for gamers that crave a high end gaming station the SP45H7 supports Intel Core™ 2 Quad Processors, DDR2 1066(OC), PCI Express™ Gen 2.0 architecture, 1600Mhz FSB, Serial ATA 3 Gb/s and has 80 Plus low power consumption for superior system performance. Powerful and surprisingly silent the model produces less than 28dBs when running heavy software applications.

ALTECH COMPUTERS
WWW.ALTECH.COM.AU

NSW
Skycomp Technology
(02) 9281 5999
skycomp.com.au

I-tech
1800 833 883
i-tech.com.au

QLD
PCsNQ
(07) 4724 2344
pcsnq.com

Umart Online
(07) 3369 3928
umart.com.au

VIC
Centre Com.
centrecom.com.au

Computer & Parts Land
(03) 9548 7088
cpl.net.au

SA
Photech Computers
(08) 8349 4334
photech.com.au

Getright Computers
(08) 8231 0622
getright.com.au

WA
Foxcomp Technology
(08) 9331 3643
foxcomp.com.au

Vtech Industries
(08) 9313 4991
vtechindustries.com.au

TAS
Office Equipment Warehouse
(03) 6272 6272
oewcomputer.com

Scorpion Technology
1300 726 770
scorptec.com.au

Grand Theft Auto IV

The great criminal epic comes to PC at last. Unfortunately.

Sometimes you simply wish things never happened. Like after the work Xmas party, and you realise you've not only snogged the receptionist, but her best friend too – and he's a guy! Well, GTA IV on PC is like that. It takes the memory of a great game – and do not mistake us, on Xbox, it still is – and does unfortunate and often obscene things with it.

Things you just wish had never happened.

First up, let's talk DRM. The game uses SecureROM copy protection; on top of that, it requires online verification of your copy. Not online? Well, that's okay, 'cause you can go to another PC and download an automated patcher matched to your game's license key. Don't have access to the net at all? Tough.

Now, someone being in that kind of isolated position is frankly rare these days, but we still find that an offensive amount of control. Not to mention that SecureROM itself is often behind a lot of issues in and of itself.

The next hurdle you've got to jump through is the Rockstar Social Club and Games for Windows Live registration. If you want to enjoy any of the game's otherwise excellent multiplayer, you'll need to be signed up for both services. If you've already got a Live login, either PC or Xbox, you're okay, but it's simply frustrating to have to go through so much just to play a game – does Rockstar want me to resent them? Not to mention the fact that for many people that very process itself is buggy one. We certainly went through a couple of crashes before we got it all up and running, and finally got into the game itself.

To then discover that when Rockstar says you really do need to have the latest drivers installed. No, really, they're not kidding. Our NRG test system, packing a not inconsiderable 4870X2, could barely handle the opening in-engine cut-scene, and practically shat itself during the opening driving sequence. One more driver download and install later, we thought we had the game – if not the City itself – conquered. Driving was smooth, the graphics were a large improvement, and small touches like bloody sprays really give the game a fresh feel. Then we turned a corner, to see all of the city laid out before us.

Sputter. Cough. System death. We've read that the game has issues with ATI hardware, but we had no idea just how bad they were.

We had thought that reviewing GTA IV on PC would be a tough call, that it would be hard to simply not parrot the high praise we gave the original (which we scored a whopping ten out of ten). Instead, we're just thankful we don't have to waste space talking about the story, and can instead devote time to the whiney rant the game deserves. GTA IV was and still stands as a landmark in gaming, a story of incredible quality and nuance, and a helluva fun game to boot. That we swore off the PC port as soon as we could speaks volumes about its quality. There are volumes more on the many forums where other gamers are voicing their own frustration. Rockstar has a list of bugs and workarounds, and is promising to fix the worst, but that's simply not good enough.

This is, simply, a game we cannot recommend, and it's only our fondness for the title on console that spares it from an Epic Fail award. **DH**

PC

Developer Rockstar North
Publisher Rockstar Games
Website www.rockstargames.com/IV/

Graphics Technically strong, but lack of in-game AA and poor ATI performance hurts it.	64
Gameplay Once you get in the game, great. But we do not like DRM.	87
Sound About the only part of the game that's still flawless.	94

Overall
A clear case of the whole being far less than the sum of its parts.

72%

LIAN LI
www.lian-li.com

ALUMINUM PC CASE
SAILS WITH SPEED

Hand Crafted

Create transcendent style
Innovative and delicate three-layer zone design

PC-888

Bays: 5.25" x 2 (include CD-ROM bezel),
3.5" internal x 4 (SATA / SAS hot swap)
M/B type: ATX / M-ATX

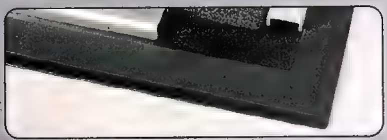
SATA / SAS hot swap

2009 LATEST SILENT DESIGN

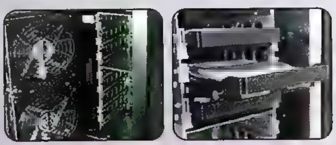
PC-B71 **PC-B70** **PC-B10**

Bays:
PC-B71 5.25" x 5, 3.5" x 1(use one 5.25" to 3.5" converter)
3.5" internal x 10 (SATA / SAS hot swap x 7)
PC-B70 5.25" x 5, 3.5" x 1(use one 5.25" to 3.5" converter)
3.5" internal x 10
M/B type: E-ATX / ATX / M-ATX

Bays: 5.25" x 5 (included BZ-502, use 5.25" x 3 bay),
3.5" internal x 4
M/B type: ATX / M-ATX



Side Panel has equipped the sound insulation foam internal cladding, with anti-vibration rubber strips around the edges to seal the gap, and reduce vibration and noise.



Front access SATA / SAS hot swap bays (PC-B71)

Extreme Power Supply

80+ EFFICIENCY

MAXIMA FORCE

Optimized for PC Gamer & PC Enthusiasts

PS-A470GB	470W	570max
PS-A650GB	650W	750max
PS-A750GB	750W	850max

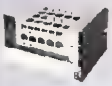
* PS-A650GB / PS-A750GB is blue LED fan

SILENT FORCE

Tuned for Best Silent Performance

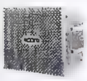
PS-S650GE	650W
PS-S750GE	750W
PS-S850GE	850W

OPTION KITS Visit www.lian-li.com for more information.



EX-H33

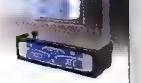
EX-33



BZ-502

BS-08

CR-36



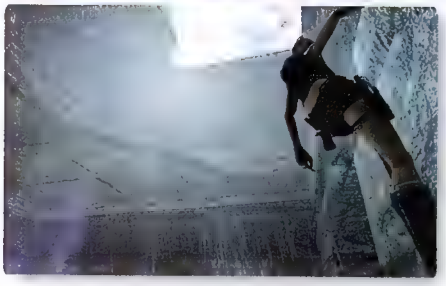
TR-5B

Distributor

Anyware™
www.anyware.com.au

mittoni
extreme technology distribution
www.mittoni.com.au
Tel:03 95408989

Finest Quality
Made in Taiwan



Tomb Raider: Underworld

We keep abreast of the latest Lara Croft adventure.

After the gameplay nastiness of Tomb Raider: Angel of Darkness, Lara Croft appears to be doing better for herself these days. The previous game in the series, Tomb Raider: Anniversary, was a somewhat welcome return to form, bringing back all that was good about the pixellated temptress in the first place.

Like Anniversary, we're delighted to say that Underworld's gone back to first principles, with all those compellingly epic elements of the 1996 original. Ambitious environments, captivating atmospheres and intriguing puzzles, combined with a liberating pace brought about by the total isolation from the outside world. And all with a control system that won't drive you to beat yourself to death with a mouse.

The environment is familiar, too: ruined temples, vast underground caverns, overgrown ruins – that kind of thing. And from the off, they look superb. A written-from-scratch game engine (which, incidentally, will be used in the upcoming Deus Ex 3) makes crossing vast distances effortless, lighting effects exquisite, and lends landscapes an organic edge that's truly impressive. Bodies of water were perfected a few years back, but now rocks and vegetation look incredibly complex, shadows are both subtle and striking, and even tricky stuff like water droplets look pretty good. And it isn't a huge performance hog, either, running on mid-range systems without a grumble and looking absolutely superb on our 4870X2-powered NRG test machines.

A malleable environment is very 'in', so expect muddy knees if you bend down, or to be covered in dust after a roof collapse. The effect is helped by some nice touches of animation, such as Lara putting out both hands to brush vegetation out of the way, or just one if she's carrying a gun.

Thanks to some serious motion-capture work with Olympic gymnasts, Lara's no slouch in the agility department. Both keyboard and gamepad are easy enough to get to grips with: you have a grappling hook that will interact with other objects to form pulley arrangements, and objects that can be carried, dropped, thrown, pushed or fought with. And quite a lot of time a motorbike features. There's the occasional bit of combat, too, with Lara's targeting system feeling a bit more streamlined. But compared to a decent first-person-shooter, it's still a joke – no AI to speak of, and some very oddly positioned, spookily identical corpses.

And there are some irritating moments. The roving camera frequently fails to place itself anywhere useful – often simply flickering around Ms Croft's back end like some crazed underworld dog. Object detection is also sloppy on occasion; at one point, we found our feet buried inside a Kraken we'd been idly standing on. And no-one wants that. Trying to jump somewhere you're not supposed to also results in some ugly, nauseating camera bouncing, and swimming is as irritating as ever. But it all just about stays on the right side of challenging, and looks (and sounds) so good, you can take a few seconds off to marvel at that bird flying past.

So Tomb Raider fans will be pleased. And even if previous instalments have failed to wow you, this would be a good time to check back in. It isn't non-stop action, it's no fun as a shoot-em-up, and there aren't many strategic moments where, say, a 32-button press sequence while counting in Aramaic will be required. Instead, you'll be creeping round corners, jumping at every sudden movement, and emerging to a series of stunning vistas... before cringing as you drop Lara off a craggy cliff face to her temporary doom. Can't ask for more.

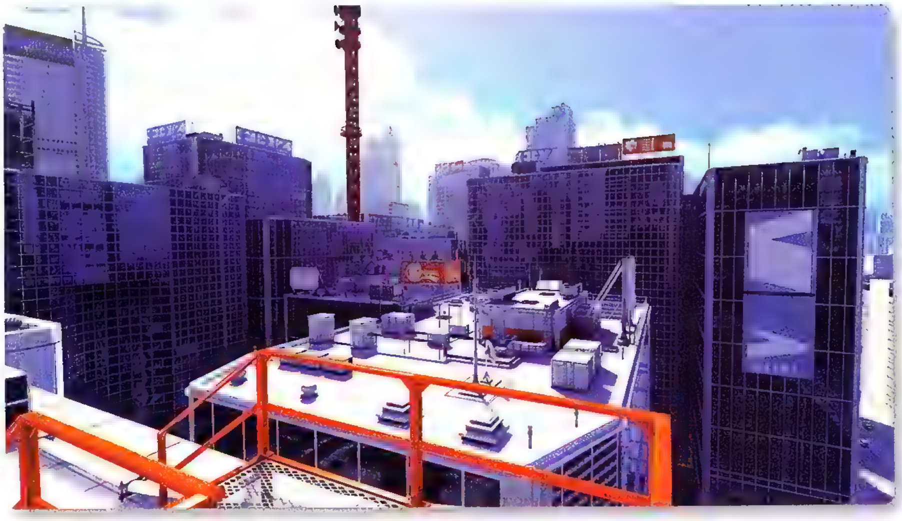
PC, Xbox 360, PS3 and more (reviewed on PC)

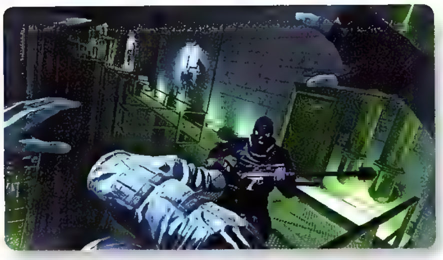
Developer Crystal Dynamics
Publisher Eidos Interactive
Website www.tombraider.com/

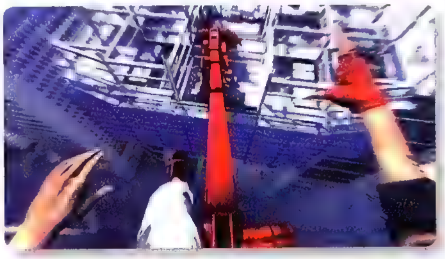
Graphics	Surprisingly rich and immersive.	89
Gameplay	Pretty much no surprises, but fun enough.	78
Sound	Rich and varied.	83

Overall A return to form for everyone's favourite jumping archaeologist.

82%

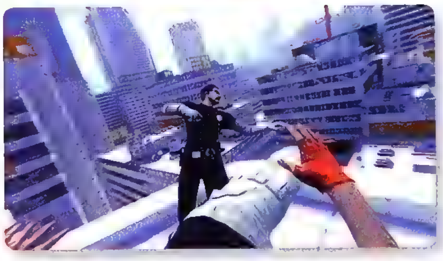






Mirror's Edge

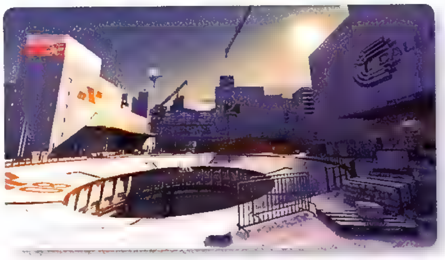
The prettiest jumping puzzle ever made, but where's the actual game?



One of our favourite games of all time is Max Payne, a notoriously short title that made up for lack of length by presenting a tight, stylised story punctuated by balletic gunplay and violence. Mirror's Edge, another surprisingly new IP from EA, is even shorter than Max Payne – a clever player can finish it in around six hours. If it were a perfect six hours we wouldn't mind, but as much as we love what the developers, DICE, have tried to do with Mirror's Edge, the game never quite makes the cut.

The game's premise is pretty cut and dried. In an indeterminate future the government tightly controls all aspects of its citizens' lives. Crime is down, censorship is up and Big Brother is always watching. There are – of course – those who want to fight the power, and to get around the ubiquitous communication surveillance they employ runners. The rooftops are a runner's playground, as they evade police and deliver messages and other cargo.

The game kicks off with the usual training level, and it does a good job of introducing you to what is a very natural control scheme. Given the fast pace of the game, having a control scheme that you can quickly and intuitively master is a must-have, and Mirror's Edge nails that aspect of the gameplay, at least. It's all about momentum, which you build up as you run, leap and slide all over the high steel of the city; more momentum lets you run faster and leap longer, and when you get a good head of steam built up and hit all the right jump off points the game is one of the most exhilarating you'll ever play.



From the training level – which is cunningly explained as a simple warm-up following time off from running after an injury – the game gets into gear and starts feeding you what passes for plot.

The game's story – one of political infighting, inevitable betrayal etc etc – has the unique distinction of being at the same time rather dense and twisted and yet still kind of light and wishy-washy. And, as we said, the game's almost criminally short, so that plot doesn't last long either.

But it's the free running movement that the game's really about, and the plot is really only an excuse to kick down doors and jump all over the joint. It's great when it all comes together, but it doesn't take much for you to lose momentum – both literally and figuratively. For every great sequence of running about, there are at least two portions of careful jumping and puzzle-solving. It's like making an entire game out of the annoying and out of place jumping level from Half Life!

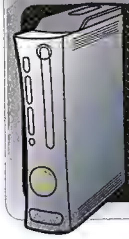
Combat does feature, but you're told early on that it's best avoided, and boy is that true. There are no health bars or ammo counters in the game, but then again it'll only take a bullet or two to put you down, and not many more punches. You can string together some very impressive moves if you need to, and the jumping system comes into this as well, but mostly evasion is your friend. Sadly, some very annoying sequences also involve one-shot-kill snipers who are almost impossible to avoid. We don't mind games that are challenging, but games that are simply cruel in the randomness of their lethality are another thing entirely.

Mirror's Edge is a game we really wanted to like, and there's a lot about it that we do wholly dig – the music is top notch ambient techno, the graphic design of the un-named city it's set in is truly fresh and unique, and the game's protagonist is a wonderfully strong female character who actually seems like a real person – but the total package is bit of a letdown. There's some downloadable content to be released next year, so that may give the game some legs, but essentially this game is too short and too inconsistent to easily recommend. **DH**

PC, 360, PS3 (tested on 360)

Developer E.A. Digital Illusions C.E.
Publisher Electronic Arts
Website www.mirrorsedge.com

Graphics Clean and crisp, though some frame drops are evident.	82
Gameplay Frustratingly inconsistent. Great when it works, though.	63
Sound Great music – almost better to listen to than play!	97



Overall
Ten out of ten for the effort, but ultimately it's a flawed one.

70%

THINGS TO SEE

Star Trek

Director JJ Abrams
Starring Chris Pine, Zachary Quinto, Karl Urban, Simon Pegg

Taking a leaf from Zack Snyder's Watchmen playback, JJ Abrams has been taking 20 minutes of footage of his upcoming Star Trek re-imagining on the road to show to the press. He's busy cutting the film together, so he's not personally presenting the footage, but he opens with a canned introdcution to each scene, and an embarrased admission that he's not actually a Trek fan.

Having now seen that footage, at a screening today in Sydney, his distance from the considerable legacy that sits behind the Trek franchise can only be a good thing. The four scenes we were treated to were tight, respectful of the original material, and yet wholly and totally modern.

It's hard to walk away from the footage without thinking that Abrams is on to something here. Each actor brings a lot of new depth to the characters, but in all of them you can still quite clearly see the original actor's influence. Hell, they're *still* playing Chekov's accent for laughs! Karl Urban as Bones is particularly good, and his cries of "Damn it, Jim!" will cause pangs of nostalgia in anyone. In particular, the decision to not immediately make Kirk and Spock friends takes a lot of pressure off the actors, who can now instead work on building their own chemistry, much as Shatner and Nimoy did before them.

And let's not forget one of the most important stars… the Enterprise herself. Abrams has gone in a very different direction in presenting the ship's interior and locales. While the upper decks are suitably gleaming and bright, below desks is a little more cramped, and engineering spaces are positively crammed with piping and machinery. It gives the ship a look that is at one and the same time futuristic, but also still sort of… primitive when compared to the tech we've seen in previous films set later in the Trek timeline.

We're quietly confident that come March next year, we'll be thrown back into Trek fandom, and be loving every minute of it. For a fuller look at the preview, head to our website: **http://www.atomicmpc.com.au/News/130056,star-trek-is-looking-good.aspx**

THINGS TO DO

Star Wars:

Where Science Meets Imagination

Where Powerhouse Museum, Sydney: December to April 2008; Scienceworks, Melbourne: June to November 2009.

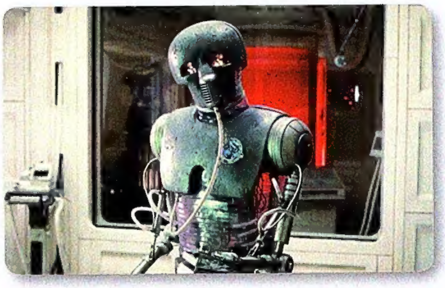
It's a testament to the enduring nature of Star Wars' attraction that four crappy movies and a fair to middling TV show cannot kill it off. All of us in the office cannot help but thrill to the sound of a lightsaber firing up, or get a militant spring in our step when we listen to the Imperial March. It's that thrill that makes the Powerhouse Museum's new Star Wars: Where Science Meets Imagination exhibit such a guilty pleasure.

Ostensibly, the exhibit is about showing modern technologies in the light of the imaginary ones from Star Wars. One display features the Wampa beast and Snowtroopers that featured in the snowy Hoth sequence from The Empire Strikes Back, while also talking about modern sub-zero environments and the lengths that we need to go to to survive them. Similarly, a display of Darth Vader's black armour from A New Hope is accompanied by an interactive display on bionics and human-machine interfaces.

A lot of the interactivity is aimed at children, but if the number of press and other media day invitees we saw messing about with lego maglev trains and toy robots is anything to go by, it's a show for all ages.

But the real draw for any fan of the series are the models and costumes on display, as well as a host of other props.

The crowning glory – at least in our humble yet geeky opinion – would have to be the original Millennium Falcon model. It's a glorious piece of work, and seeing the iconic spaceship up close gives you a real appreciation for the model maker's art. The intricate detailing, from battle damage to small decals that you can't even see on screen, it's worth the price of admission in its own right. You can even pick out the original model kits some of the parts came from!



Other great models include the Star Destroyer from A New Hope, a TIE Fighter, an X-Wing and various walkers from AT-ATs to newer (older?) designs from the more recent trilogy. Each set of models is accompanied by a video presentation detailing its creation and use in the films. There aren't many new insights to be gleaned – especially if you're already an in depth Star Wars tech geek – but it certainly rounds out the presentation.

The costumes are pretty neat too, and Han Solo's duds are as cool close up as they are on the man himself. There are wookie suits, as well, plus various Jedi robes and Stormtrooper armour suits. Accompanying the exhibit on press day, and apparently present throughout the show's duration, where a lot of costumed Star Wars enthusiasts. These guys were just as fascinated by the chance to see the clothing and armour they recreate up close!

A lot of props and droids are also on display, and we can easily say the Interrogation Droid from A New Hope is just as menacing in person. All up it's an exhibition worth catching – and you might even learn a thing or two!

Star Wars: Where Science Meets Imagination is at the Powerhouse Museum in Sydney from December to April 2008, and then goes to Scienceworks, in Melbourne, from June to November 2009. **DH**

NEW ANIME RELEASES

January 14

- BLEACH V12
- CODE GEASS: LELOUCH OF THE REBELLION V3
- LE CHEVALIER D'EON COLLECTION (6 DISC SET)
- LUCKY STAR COLLECTION 1 (EPS 1-12) (3 DISC SET)
- MUSHISHI COLLECTION
- NARUTO (UNCUT) COLLECTION 09 (EPS 107-120) (3 DISC SET)
- NOEIN COLLECTION (5 DISC SET)
- TSUBASA CHRONICLES (TV) V08
- XXXHOLIC V06

February 4

- THE GIRL WHO LEAPT THROUGH TIME (2 DISC SET)

MADMAN ENTERTAINMENT

Fallout

This month David Hollingworth and James Matson start a long conversation about the state of MMO gaming. Follow their fave games, their hits and their misses of the last 12 months in the massively multiplayer world.

DH: I've made the decision. As much as I loved – and I mean thoroughly enjoyed – Warhammer Online when it worked, I recently cancelled my subscription. There's just too many other games, and on top of that, the new Lord of the Rings Online expansion recently hit my hard drive, and boy is it rocking. How are you finding WAR – still digging it?

JM: *I'm still digging WAR despite the bite sized flaws surrounding it. It's obviously expansion season in the MMO world, because I've had to devote some time to the latest EverQuest 2 expansion myself, but it hasn't torn me away from WAR. I class them as two completely different games loosely associated by genre. Very loosely. Think Pamela Anderson loose, and you're there. So why didn't WAR keep you hooked? It's a Player-versus-Player dreamland! Not your thing?*

DH: Man, that's loose.

You're right, it's PvP excellence, no doubt. But as much as laying the smack down on Chaos Warriors is a joy unto itself, I'm also a long term fan of the Warhammer world. I've wargamed and roleplayed in that background for more years than I'd like to count, and it just felt like the world I'd come to know so well had been… watered down a bit. Plus, trying to find a properly populated Roleplaying server, so that there's enough players to make the awesome PvP actually happen was bit of a challenge. In the end, as much as there was a lot of like about WAR, there just wasn't quite enough to keep me hooked. And, as I said, the new Mines of Moria expansion is just too good to ignore.

Speaking of which, how is EverCrack these days?

JM: *It's odd, isn't it - that the core appeal of Warhammer isn't for the fans who've carefully nurtured the Warhammer universe, characters, factions and conflicts, but for those who really are just after a Warhammer 'skin' to a PvP MMO. Fortunately, War does the latter so damn well that I'm still happy to see Mythic suck monthly withdrawals from my credit account. War is watered down, that's for sure – but I think for you it might be a case of incompatibility between user and game.*

War takes the MMORPG, amputates the RPG and leaves the MMO intact sprinkled with an emphasis on action. I'm strangely hungry now.

Roleplaying servers are – by and large – the oddity of the MMO world. Ordinary gaming folk see a 'Roleplaying' server in EverQuest 2 or Warhammer Online and immediately concoct vicious ideas in their heads of a game world festering with an 'I live in the basement' population. Roleplaying servers are fated to be lower population when stacked up against normal servers. On a standard 'Core' ruleset Warhammer server however population isn't an issue and the gamers online are in tune with the concept of Mythic's small slice of War. As far as a pure PvP game with a global population is concerned, Warhammer has the perfect mix of balance, class diversity and engaging scenarios to make it worth my bucks. Realm-Versus-Realm needs some major tweakage, but nothing insurmountable.

Anyway, EverQuest 2 is going marvellously, in my books it's the gourmet meal to World of Warcraft's 'Cheeseburger' approach. Incredibly rich landscape, intricate storyline, lots of classes and races and a 3D engine that was designed back in 2005 to run on 512MB GPUs that didn't even exist then – it's aged well. The latest expansion (seems to be the season huh?) doesn't raise the level cap, but extends the ability to tailor individual skills and abilities of your characters, plus chucking in a generous helping of new zones, dungeons and raids, most of which I'm yet to touch. So what would it take to bring you back to Warhammer? Something? Anything? Or have you put down your Elvish blade for the last time?

DH: I may come back if and when the 'missing' four racial capitols make an appearance, but – by and large – I think I'm just done with it. I played Age of Conan for a good long while, too, but I've similarly let that one slide as well. Both WaR and AoC are great games, real achievements in MMO gameplay. That's not say they were without their flaws, but they both took an established genre, one dominated by WoW, and brought new and interesting things to market. AoC's combat was a refreshing step in the right direction, and it was never afraid to use the brutal and sometimes ugly source material to really quite good effect.

But there's only so much time you can put into games like this – I mean, they are designed to mammoth time hogs. I get amazed at people who are already hitting the new level cap in WoW, for instance. Just how do they have that much time on their hands?!?

No, I've pretty much re-directed my MMO energies back into Lord of the Rings Online, thanks to the new Mines of Moria expansion. You might say I've put down one elven blade so I pick up another one… TBC

PowerColor®

www.powercolor.com

atomic 2005 READER AWARDS WINNER BEST VIDEO CARD MANUFACTURER

atomic
Video card manufacturer of the year
ReaderAwards2003

Experience the amazing HD gaming performance!
PowerColor
LCS HD 4870
PCS HD 4850
HD 4830

LCS HD4870

Video Memory: 512MB GDDR5
Engine Clock: 800 MHz
Memory Clock: 1900 MHz (950 MHz x2)
Memory Interface: 256-bit
Direct X® Support: 10.1

PCS+ HD4850

Video Memory: 1GB GDDR3
Engine Clock: 665 MHz
Memory Clock: 1900 MHz (950 MHz x2)
Memory Interface: 256-bit
Direct X® Support: 10.1

HD4830

Video Memory: 512MB GDDR3
Engine Clock: 575 MHz
Memory Clock: 1800 MHz (900 MHz x2)
Memory Interface: 256-bit
Direct X® Support: 10.1

LCS *Liquid cooling design to lower the temp efficiently, with superb overclocking ability*

PCS+ *Unique cooling deign tolower the temp, with superb overclocking ability*

ATI RADEON™ PREMIUM GRAPHICS

ATI CROSS FIRE X™ TECHNOLOGY

Manufacturer

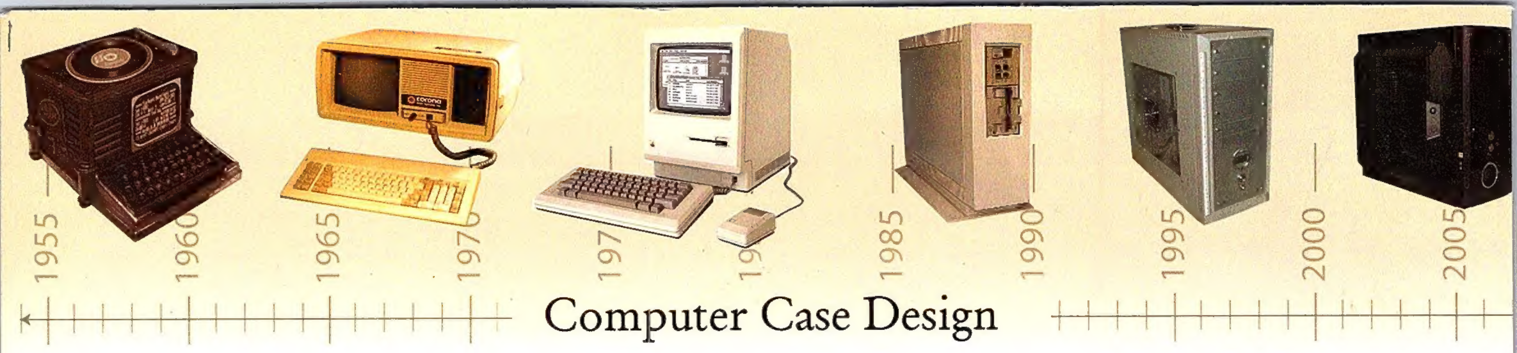
TUL™
TUL Corporation
WWW.TUL.COM.TW

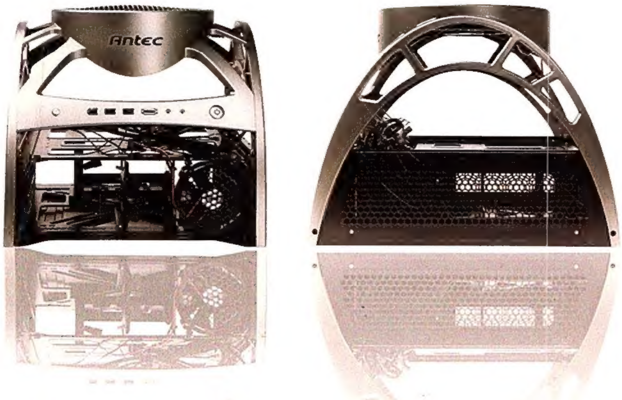
Distributor

Australia IT
Australia I.T. Pty Ltd
+613 9560 3188 (Melbourne)
+612 9643 1388 (Sydney)
www.australiait.com.au

Premium Resellers

www.auspcmarket.com.au
www.techbuy.com.au
www.umart.com.au
www.pccasegear.com.au
www.scorptec.com.au
www.i-tech.com.au
www.pcmaniacs.com.au
www.skycomp.com.au





Okay, so we skipped a few generations.

The Skeleton Case from Antec, here ahead of time.

Antec
Believe it.

ALTECH COMPUTERS
WWW.ALTECH.COM.AU

NSW
Aus PC Market
(02) 9646 8000
auspcmarket.com.au
Digital Star
(02) 8748 6800
digitalstar.com.au

QLD
Computer Alliance
(07) 3420 3200
computeralliance.com.au
Umart Online
(07) 3369 3928
umart.com.au

VIC
Centre Com.
-
centrecom.com.au
Scorpion Technology
1300 726 770
scorptec.com.au

SA
Allneeds Computers
(08) 8211 8661
allneeds.com.au
Getright Computers
(08) 8231 0622
getright.com.au

WA
Austin Computers
(08) 9201 2788
austin.com.au
PLE Computers
(08) 94039613
ple.com.au

TAS
Principal Computers
(03) 6234 5677
tasmanianpc.com.au
Taspro Computers
(03) 6424 1911
taspro.com.au